TECHCHAPLET

2024-25



GURU NANAK INSTITUTE OF TECHNOLOGY

Department of Computer Science & Engineering

VISION OF THE DEPARTMENT

To produce proficient professionals of global standard with respect to industry, academia, and entrepreneurship who can play a key role in their respective domain and become a responsible citizen for the society.

MISSION OF THE DEPARTMENT

DM-1: To impart quality education with holistic development to produce professionals with leadership traits.

DM-2: To impart knowledge on emerging technologies and entrepreneurship skills to produce technocrats of global standard and entrepreneurs.

DM-3: To promote interdisciplinary work culture and opportunity to work in a team through collaborative research and project work.

DM-4: To inculcate professional ethics and moral responsibility for a better society.

PEO

PEO 1: Our graduates will establish themselves as effective professionals in industry, academia and entrepreneurship.

PEO 2: Our graduates will become profound researchers in multiple domains.

PEO 3: Our graduates will act as a leader in society.

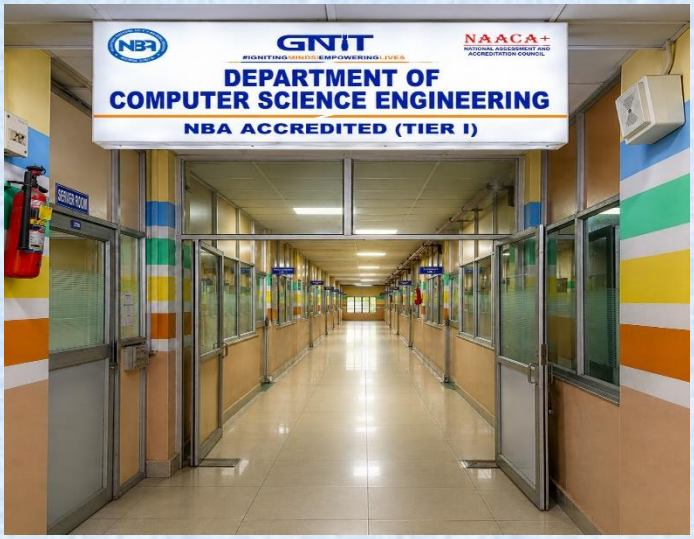
PROGRAMME SPECIFIC OUTCOMES (PSOS)

PSO 1: Ability to use efficient algorithm for designing and developing software applications and products.

PSO 2: Ability to correlate computer science and core engineering subjects to solve real life problems across multiple domains.

PSO 3: Ability to write code efficiently in competitive environment in national and international platform.

ABOUT THE DEPARTMENT



The Department of Computer Science and Engineering, established in 2003, stands out as a premier destination for academic excellence and research-driven learning. Widely recognized as a B.Tech in Computer Science College in Kolkata, the department offers a vibrant environment where students receive top-tier technical education alongside holistic personal development through various co-curricular and extra-curricular activities.

Ranked among the Top B.Tech CSE Colleges in Kolkata, the department provides students with a strong foundation in both theoretical knowledge and practical skills. Focus areas include the latest technologies such as Artificial Intelligence, Machine Learning, Cybersecurity, Cloud Computing, and Data Science. Students benefit from advanced laboratories, live projects, and industry collaborations, ensuring hands-on learning experiences. The department also fosters a robust research culture, encouraging students to publish research papers, work on innovative projects, and participate in departmental newsletters and technical magazines to enhance their analytical and communication skills.

As one of the Top Computer Science Engineering Colleges in Kolkata and counted among the best colleges for B.Tech CSE in India, the department is committed to producing graduates who are not only academically proficient but also equipped with leadership qualities, entrepreneurial mindsets, and a global perspective. Whether you are searching for the best colleges for B.Tech CSE, reputable B.Tech CSE colleges near you, or simply looking for a college that combines academic rigor with industry relevance, this department stands as a trusted choice.

MESSAGE FROM PRINCIPAL'S DESK



Guru Nanak Institute of Technology (GNIT), established in 2003 under the Guru Nanak Educational Trust, is a premier institution of the JIS Group Educational Initiatives. Affiliated with Maulana Abul Kalam Azad University of Technology (MAKAUT) and approved by AICTE, UGC, NAAC (A+), and NBA, GNIT offers undergraduate, postgraduate, and doctoral programmes in engineering and technology. The institute became autonomous in 2016 and is the first private engineering college in West Bengal to achieve NAAC A+ accreditation. Located in North Kolkata, GNIT provides a modern, student-friendly campus with advanced laboratories, smart classrooms, digital library facilities, sports infrastructure, and innovation centres. The institute promotes an eco-friendly, plastic-free, smoking-free, and ragging-free environment that supports the holistic development of students. With around 2,000 students, GNIT combines strong academic foundations with practical learning through project-based education, internships, industry collaborations, cloud computing, High Performance Computing (HPC), and state-of-the-art research facilities.GNIT actively promotes research and innovation through AICTE MODROB, DST, SERB, and MOFPI funded projects, along with entrepreneurship initiatives under the Institution's Innovation Council (IIC).

With its emphasis on academic excellence, research, innovation, and professional development, GNIT continues to prepare competent engineers, researchers, and future leaders capable of meeting global challenges.

Prof. (Dr.) Swarup Kumar Mitra

Principal, Guru Nanak Institute of Technology, Kolkata

MESSAGE FROM HOD'S DESK



It gives me immense pleasure to present **TECHCHAPLET**, the annual student magazine of the Department of Computer Science & Engineering, Guru Nanak Institute of Technology. This magazine is a celebration of the creativity, imagination, and intellectual spirit of our students. TECHCHAPLET provides a platform where students can express their ideas, share their experiences, showcase their literary and artistic talents, and present their perspectives on technology, innovation, and society. Every article, poem, story, artwork, and creative contribution reflects the enthusiasm and potential of our young minds. I congratulate all the students whose contributions have made this edition possible. I also appreciate the dedicated efforts of the editorial team and faculty members for encouraging and guiding our students in this creative endeavor.

I hope TECHCHAPLET inspires every student to think creatively, write confidently, and continue exploring new ideas beyond the classroom. May this magazine motivate our students to develop not only as skilled professionals but also as thoughtful, responsible, and innovative individuals.

Prof. (Dr.) Suman Bhattacharya

Head of the Department

Department of Computer Science & Engineering

Guru Nanak Institute of Technology

MESSAGE FROM EDITOR'S DESK



Dear Readers,

Welcome to the Editor's Desk of **TECHCHAPLET**, the esteemed technical magazine of the Department of Computer Science & Engineering at Guru Nanak Institute of Technology. We are thrilled to present our latest edition, filled with captivating articles from our talented students and accomplished alumni. TECHCHAPLET serves as a platform to explore the recent trends and advancements in Computer Science and Engineering.

In this edition, our contributors delve into a diverse range of topics, including artificial intelligence, machine learning, data science, cybersecurity, and software engineering. The articles provide valuable insights into emerging technologies, industry best practices, and groundbreaking research, offering a glimpse into the forefront of our field. We take pride in the intellectual prowess of our students and alumni, who continually push the boundaries of knowledge and contribute to the growth of the industry. As you embark on this enriching journey through the pages of TECHCHAPLET, we invite you to immerse yourself in the thought-provoking ideas and innovative concepts presented within. We hope that the articles inspire you, stimulate discussions, and foster a passion for lifelong learning in the dynamic landscape of Computer Science and Engineering.

Thank you for your continued support, and we hope you enjoy this edition of TECHCHAPLET!

Sincerely,
Ms. Sayani Chandra
Editor-in-Chief, TECHCHAPLET
Department of Computer Science and Engineering
Guru Nanak Institute of Technology

SOME MORE DETAILS...

Editor

Ms. Sayani Chandra, Assistant Professor, Dept. of CSE

Student Editors

Ahana Sen,2nd Year, CSE, Student Editor

Arghya Chakraborty,2nd Year, CSE, Graphic Designer

Nowrin Parveen,2nd Year, CSE, Technical Content Scrutinizers

Saptarshi Ghosh,3rd Year, CSE, Technical Content Scrutinizers

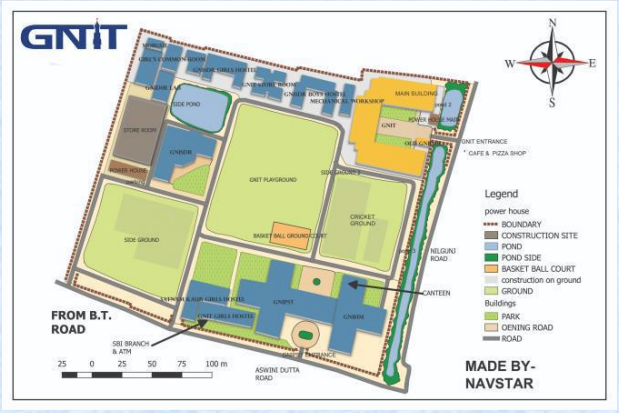
Priyabrata Chakraborty, 3rd Year, CSE, Technical Content Scrutinizers

Courses Offered (CAY: 2024-25)

Course Name	Duration	Intake
B.Tech	4 years	180
M.Tech	2 years	18

Contact us:

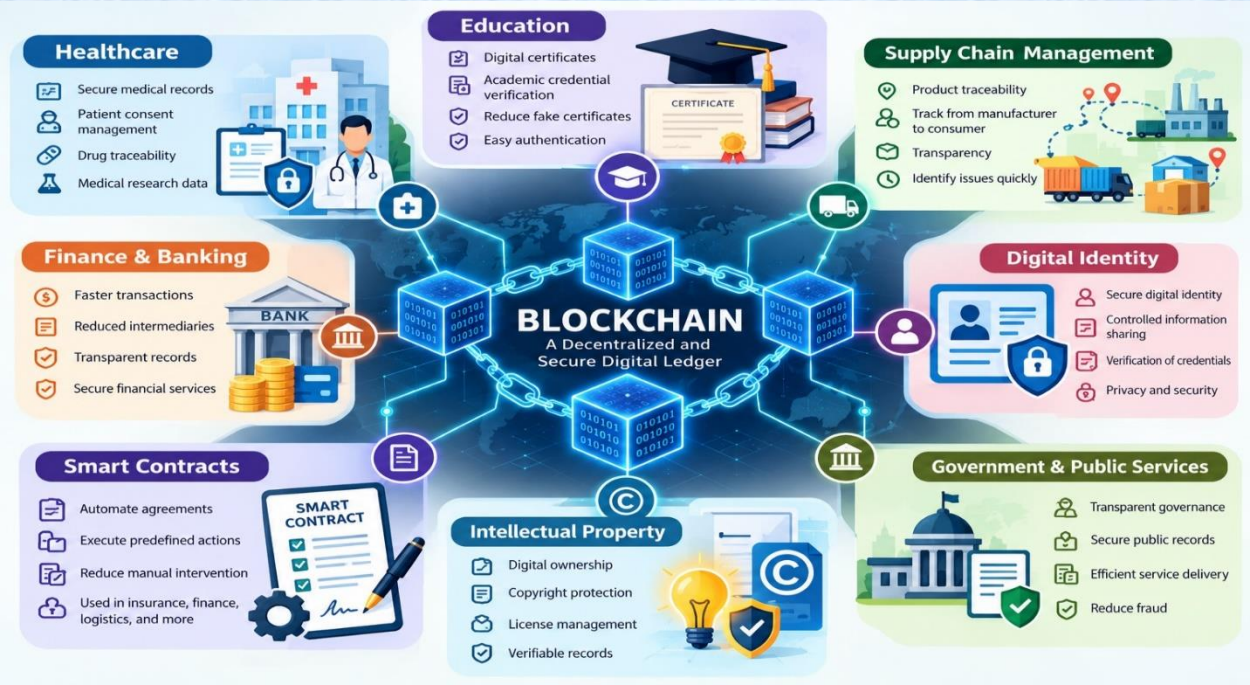
Address: 157/F, Nilgunj Road, Panihati,
Kolkata - 700 114, West Bengal, India
Phone: +91 33 2523 3900
Email: info.gnit@jisgroup.org
Website: http://www.gnit.ac.in



Blockchain Beyond Cryptocurrency

Blockchain technology is one of the most significant digital innovations of the modern era, initially gaining widespread attention through cryptocurrencies such as Bitcoin and Ethereum. However, blockchain is much more than a technology for digital currencies. It is a decentralized and distributed digital ledger that enables information and transactions to be recorded, verified, and shared securely across a network. Unlike traditional centralized databases, where information is controlled by a single organization or authority, blockchain distributes records among multiple participants, making unauthorized modification significantly more difficult. Its key characteristics—including decentralization, transparency, traceability, security, and tamper-evident record keeping—have created opportunities for applications across numerous sectors.

At the core of blockchain technology is the concept of a distributed ledger, where transactions are grouped into blocks and linked together using cryptographic techniques. Once a block is verified and added to the chain, altering previously recorded information becomes difficult because subsequent blocks are cryptographically connected to it. Blockchain networks also use consensus mechanisms to allow participating nodes to agree on the validity of transactions. Another important innovation is the smart contract, which is a computer program stored on a blockchain that can automatically execute predefined actions when specific conditions are satisfied. Together, these technologies provide a foundation for developing digital systems that can operate with greater transparency and reduced dependence on intermediaries.



The applications of blockchain extend across many industries. In healthcare, blockchain can support secure sharing of medical records, patient consent management, pharmaceutical traceability, and medical research data. In education, blockchain can be used to issue and verify digital certificates and academic credentials, helping institutions and employers authenticate qualifications efficiently. In supply chain management, blockchain can record the movement of products from manufacturers to distributors and consumers, improving traceability and helping organizations identify problems in the supply chain. The technology is also being explored in banking, insurance, digital identity, intellectual property management, logistics, and government services.

One of the most promising applications of blockchain is smart contracts. Traditional agreements often require intermediaries, paperwork, and manual verification. Smart contracts can automate predefined processes by executing programmed instructions when specified conditions are met. For example, in an insurance application, a smart contract could automatically initiate a predefined process when verified conditions associated with a claim are satisfied. Similarly, blockchain-based systems can support digital ownership and intellectual property management by maintaining verifiable records of ownership, licensing, and transactions. These applications demonstrate how blockchain can transform conventional processes by combining automation with verifiable digital records.

Despite its potential, blockchain technology also faces several challenges. Scalability, transaction speed, energy consumption, privacy, regulatory uncertainty, interoperability, and implementation costs remain important concerns. Blockchain does not automatically guarantee that the information entered into the system is correct; it primarily helps preserve the integrity of recorded information. Therefore, appropriate data validation, access control, cybersecurity measures, and governance mechanisms are essential for successful implementation. Organizations must carefully evaluate whether blockchain provides genuine advantages over conventional database technologies before adopting it.

For Computer Science and Engineering students, blockchain provides an exciting field for learning, innovation, and research. Understanding blockchain involves concepts from cryptography, distributed systems, computer networks, databases, cybersecurity, software engineering, and programming. Students can explore areas such as decentralized applications, smart contracts, blockchain security, digital identity, supply-chain tracking, and integration of blockchain with Artificial Intelligence and Internet of Things technologies. These emerging areas offer opportunities to develop innovative solutions for real-world problems.

Blockchain represents a shift from traditional centralized systems toward distributed and verifiable digital ecosystems. Its future is not limited to cryptocurrencies; rather, it has the potential to support trusted digital transactions, secure information sharing, automated agreements, and transparent processes across different sectors. As the technology continues to mature, the ability to understand both its possibilities and limitations will become increasingly valuable. The future of blockchain will ultimately depend not only on technological innovation but also on responsible implementation, strong security practices, appropriate regulation, and the ability of engineers to apply the technology where it can create meaningful value for society.

DHRUBAJYOTI SAHA
2nd Year, CSE

Smart Cities: Challenges and Opportunities

The concept of Smart Cities has emerged as an important approach to addressing the challenges of rapid urbanization and creating more efficient, sustainable, and citizen-friendly communities. A smart city uses modern technologies such as Artificial Intelligence, Internet of Things (IoT), Cloud Computing, Big Data, 5G connectivity, and Geographic Information Systems (GIS) to improve urban services and enhance the quality of life of citizens. Instead of relying only on traditional infrastructure, smart cities use connected devices and data-driven systems to monitor and manage transportation, energy, water supply, waste management, healthcare, public safety, and other essential services. The objective is not simply to make cities more technologically advanced, but to use technology to create cleaner, safer, more efficient, and sustainable urban environments.

At the heart of a smart city is the Internet of Things (IoT), which connects sensors, devices, vehicles, buildings, and other infrastructure to collect and exchange information. For example, smart traffic signals can analyze traffic conditions and adjust signal timings to reduce congestion, while smart parking systems can help drivers identify available parking spaces. Similarly, sensors can monitor air quality, water consumption, electricity usage, and waste levels, allowing authorities to respond more efficiently to changing conditions. Artificial Intelligence and Big Data Analytics can further process this information to identify patterns, predict problems, and support better decision-making.



Smart cities also provide significant opportunities for sustainable development. Smart energy grids can optimize electricity distribution and integrate renewable energy sources such as solar and wind power. Intelligent street lighting can automatically adjust brightness according to environmental conditions and human activity, helping reduce energy consumption. Smart waste-management systems can monitor waste containers and optimize collection routes, while intelligent water-management systems can detect leakage and improve resource utilization. These technologies can contribute to reducing environmental impact while making urban services more efficient.

Another important area is smart transportation. Growing populations and increasing numbers of vehicles create congestion, pollution, and difficulties in mobility. Intelligent transportation systems can combine real-time traffic information, GPS, connected vehicles, public transportation data, and predictive analytics to improve mobility. Smart public transport applications can provide passengers with real-time information about buses and trains, while intelligent traffic-management systems can help authorities respond to accidents and congestion more quickly. In the future, connected and autonomous vehicles may further transform urban transportation.

Despite these opportunities, smart cities face several challenges. Data privacy and cybersecurity are major concerns because smart-city infrastructure continuously collects large amounts of information. Poorly protected devices and networks may become targets for cyberattacks. Another challenge is the digital divide, as not all citizens have equal access to smartphones, high-speed internet, or digital services. The implementation of smart infrastructure can also require significant financial investment, technical expertise, maintenance, and coordination between government agencies and private

organizations. Therefore, smart-city development must ensure that technological progress does not leave certain communities behind.

For Computer Science and Engineering students, smart cities provide exciting opportunities for innovation and research. Students can develop solutions using IoT, Artificial Intelligence, Machine Learning, Cloud Computing, Cybersecurity, Robotics, and Data Analytics. Projects such as intelligent traffic management, smart waste collection, energy monitoring, emergency-response systems, air-quality prediction, and AI-based public-service platforms can address real-world urban problems. Interdisciplinary collaboration with civil engineering, environmental science, architecture, and public administration can further improve the effectiveness of these solutions.

Smart cities represent a future where technology, infrastructure, and human needs are closely connected. However, a truly smart city should not be defined only by the number of sensors or digital services it possesses. It should be measured by how effectively technology improves people's lives, protects the environment, uses resources responsibly, and provides inclusive services. By combining technological innovation with responsible governance, sustainability, cybersecurity, and citizen participation, smart cities can transform the way people live, work, and interact with their urban environment. For the next generation of engineers, smart cities offer not only a technological challenge but also an opportunity to build a more connected, sustainable, and inclusive future.

SOMRITA BANERJEE
2nd Year, CSE

Privacy in the Age of Social Media

Social media has become an integral part of modern life, transforming the way people communicate, share information, learn, and express themselves. Platforms such as Instagram, Facebook, X, LinkedIn, and YouTube allow users to connect with people across the world within seconds. However, this convenience also creates important concerns about privacy and personal data protection. Every post, photograph, comment, search, location tag, and online interaction can contribute to a digital footprint. Social media platforms may collect information such as user preferences, browsing behavior, device details, and interactions to personalize services and deliver targeted content. While data-driven technologies can improve user experiences, excessive collection or inappropriate use of personal information can create privacy and security risks.

One of the major concerns in the digital age is the loss of control over personal information. Once a photograph, video, or message is shared online, it can be copied, downloaded, forwarded, or reshared beyond the user's intended audience. Even deleted content may have already been captured by others. Privacy risks can also arise from weak passwords, unsecured accounts, phishing attacks, malicious applications, and excessive sharing of personal details. Location information can be particularly sensitive because publicly available posts may reveal where a person lives, studies, works, or frequently visits. Therefore, users need to think carefully before sharing information online.



Another important issue is data tracking and targeted advertising. Online platforms can analyze patterns in user activity to understand interests and preferences. This information can be used to personalize advertisements, recommendations, and content. Although personalization can be useful, users may not always understand what information is being collected or how it is being processed. The increasing use of Artificial Intelligence and automated data analysis makes responsible data management even more important. Clear privacy policies, meaningful user consent, strong security measures, and transparent data practices are essential for building trust in digital platforms.

Social media privacy also involves the challenge of misinformation, identity theft, cyberbullying, and social engineering. Attackers may use publicly available information to create convincing phishing messages or impersonate individuals. Oversharing personal details can make users more vulnerable to such attacks. Young people and students, in particular, should develop strong digital habits, including using unique passwords, enabling multi-factor authentication, checking privacy settings, avoiding

suspicious links, and carefully verifying information before sharing it. Digital literacy is therefore an important part of modern education.

For Computer Science and Engineering students, privacy in social media provides an important area for learning and innovation. Technologies such as encryption, secure authentication, privacy-preserving machine learning, anonymization, blockchain, and cybersecurity can contribute to safer digital platforms. Students can explore projects involving secure messaging, privacy-aware recommendation systems, fake-account detection, phishing detection, and protection of personal data. Understanding both the technical and ethical dimensions of data privacy can help future engineers design systems that respect user rights while providing useful digital services.

Privacy in the age of social media is not about avoiding technology; it is about using technology responsibly and consciously. Users, technology companies, educational institutions, and policymakers all have roles to play in creating a safer digital environment. As social media continues to evolve, protecting personal information will become increasingly important. By developing good digital habits, understanding privacy settings, strengthening cybersecurity awareness, and promoting responsible technology design, individuals can enjoy the benefits of social media while reducing unnecessary risks to their personal information and digital identity.

SMARTA DAS
3rd Year, CSE

Women in Technology

Women have played an important role in the development of technology, contributing to fields such as computer science, engineering, mathematics, artificial intelligence, cybersecurity, software development, and space technology. From the early days of computing to today's rapidly evolving digital world, women have demonstrated creativity, technical expertise, leadership, and innovation. Although the technology industry has historically faced gender imbalance, increasing participation of women in STEM education and professional careers is helping create a more diverse and inclusive technology ecosystem. Women are now contributing to the development of software, intelligent systems, medical technologies, digital platforms, and innovative solutions to global challenges.

One of the most inspiring examples is Ada Lovelace, who is widely recognized for her pioneering work on Charles Babbage's Analytical Engine and is often associated with the first published algorithm intended for implementation by a machine. Grace Hopper

made significant contributions to programming languages and helped popularize the idea of machine-independent programming languages. In more recent times, women researchers, engineers, entrepreneurs, and technology leaders have contributed to areas such as Artificial Intelligence, cybersecurity, cloud computing, robotics, data science, and quantum computing. Their achievements demonstrate that technological innovation benefits from diverse perspectives and ideas.



The growing presence of women in technology also creates opportunities to address problems from different perspectives. Women professionals are contributing to the design of applications and systems in healthcare, education, finance, agriculture, smart cities, cybersecurity, and social innovation. Diversity in technology teams can encourage a broader understanding of users and communities and can help organizations consider a wider range of requirements during product development. Women entrepreneurs are also creating startups and technology-driven businesses, demonstrating that innovation is not limited to any particular gender.

Despite this progress, women continue to face challenges in some technology and STEM environments, including unequal access to opportunities, limited representation in certain technical roles, workplace barriers, and the need for stronger mentorship and professional networks. Addressing these challenges requires supportive educational environments, equal opportunities, mentorship programs, scholarships, leadership development, and workplaces that encourage participation and career growth. Schools and universities can play an important role by encouraging girls and young women to

explore programming, engineering, mathematics, robotics, Artificial Intelligence, and other emerging technologies from an early stage.

For Computer Science and Engineering students, the participation of women in technology represents both an achievement and an opportunity for the future. Women students can explore diverse career paths in software engineering, data science, machine learning, cybersecurity, research, product development, entrepreneurship, and academia. At the same time, all students can contribute to creating an inclusive technological environment by valuing collaboration, knowledge, creativity, and merit. Technology becomes stronger when talented individuals from different backgrounds are encouraged to participate and contribute their ideas.

The future of technology will depend on innovation, diversity, collaboration, and equal access to opportunities. Encouraging more women to study STEM subjects and pursue technology careers can expand the pool of talent available to solve complex global problems. Women are not simply participants in the technology revolution; they are researchers, developers, educators, entrepreneurs, engineers, and leaders shaping its direction. By creating an environment where every aspiring technologist has the opportunity to learn, innovate, and lead, society can build a more inclusive and technologically progressive future.

ASMITA MAJUMDAR
3rd Year, CSE

If Technology Could Speak

If technology could speak, it would have countless stories to tell about how human curiosity, creativity, and imagination have transformed the world. It might begin by saying, "I was created to make life easier, but I became much more than a collection of machines and programs." From the invention of the wheel and the printing press to computers, smartphones, Artificial Intelligence, robotics, and the Internet, technology has continuously evolved alongside human civilization. It has helped people communicate across continents, explore space, discover new medicines, improve education, and solve complex problems. Every technological invention carries a story of human effort, experimentation, failure, and innovation.

Technology might also remind us that it is not independent of the people who create and use it. A smartphone can connect families separated by distance, while the same device can become a source of distraction. Artificial Intelligence can help doctors analyze medical information, assist students in learning, and support researchers, but it can also

raise questions about privacy, bias, misinformation, and responsible use. Social media can bring communities together while simultaneously creating challenges related to digital privacy and online safety. Technology itself does not decide how it will affect society; its impact depends greatly on the choices people make while designing, deploying, and using it.



If technology could speak to students, it might say, "Do not simply use me—understand me." It would encourage young people to look beyond applications and devices and explore the ideas that make them possible. Behind every website, mobile application, intelligent system, robot, and digital platform are concepts from programming, mathematics, computer science, electronics, networking, cybersecurity, and engineering. Learning these foundations enables students not only to become users of technology but also to become creators and innovators who can develop solutions to real-world problems.

Technology might also speak about the importance of human values. Faster computers, smarter algorithms, and more powerful networks do not automatically create a better society. Innovation must be accompanied by responsibility, empathy, accessibility, security, and ethical thinking. Engineers and developers make decisions that can affect millions of people, making it essential to consider issues such as data privacy, environmental sustainability, digital inclusion, and the consequences of automated decision-making. The most meaningful technological progress is therefore not simply about what technology *can* do, but also about what it *should* do.

Perhaps technology's final message would be simple: "My future depends on you." The next generation will determine whether emerging technologies are used to improve

healthcare, education, sustainability, communication, and human well-being or create new challenges that society must overcome. Technologies such as Artificial Intelligence, quantum computing, biotechnology, robotics, and the Internet of Things are opening possibilities that were once considered impossible. If guided by creativity, knowledge, ethics, and human responsibility, these innovations can become powerful tools for positive change.

If technology could speak, it would not ask humans to replace themselves with machines. Instead, it might say, "Use me to amplify your imagination, not to replace your humanity." The future will not be shaped by technology alone, but by the partnership between human intelligence and technological innovation. Ultimately, technology is a reflection of human choices—and the story it tells tomorrow will depend on what we choose to create today.

SWATI SINGH
2nd Year, CSE

My Vision for the World of 2050

The world of 2050 could be a place where technology, sustainability, and human well-being work together to create a better future. In my vision, cities will become smarter, greener, and more connected, with intelligent transportation systems, energy-efficient buildings, renewable energy, and advanced waste-management solutions becoming part of everyday life. Artificial Intelligence, robotics, Internet of Things, and advanced computing will support people in healthcare, education, agriculture, transportation, and scientific research. Autonomous vehicles and efficient public transportation could reduce congestion and pollution, while smart infrastructure could help cities use water and energy more responsibly. Renewable sources such as solar, wind, and other clean technologies could play a much greater role in meeting global energy needs.

Education in 2050 could become more personalized, accessible, and technology-driven. Students may learn through immersive virtual and augmented reality environments, AI-powered tutors, interactive simulations, and global digital classrooms. Instead of depending only on traditional textbooks, learners could explore historical events, scientific experiments, virtual laboratories, and complex engineering concepts through interactive experiences. Technology could help students learn at their own pace while teachers focus more on mentoring, creativity, critical thinking, and problem-solving. Education could become increasingly accessible to learners regardless of geographical location.



Healthcare could also experience remarkable transformation. Artificial Intelligence and advanced medical technologies could assist healthcare professionals in detecting diseases earlier, developing personalized treatment plans, and analyzing large amounts of medical information. Wearable devices and intelligent sensors could continuously monitor important health indicators and support preventive healthcare. Robotics could assist in complex medical procedures and elder care, while telemedicine could connect patients with specialists across geographical boundaries. However, technology would need to be combined with human compassion, ethical standards, privacy protection, and equitable access to healthcare.

My vision for 2050 also includes a greener and more sustainable planet. Climate change, pollution, biodiversity loss, and resource scarcity are challenges that require global cooperation. By 2050, I hope cities and industries will increasingly adopt circular-economy principles, renewable energy, electric transportation, sustainable agriculture, water conservation, and intelligent resource management. Artificial Intelligence and satellite-based technologies could help monitor forests, oceans, agricultural land, and environmental changes. Technology should not simply make life more convenient; it should help humanity live within the limits of the planet.

At the same time, the world of 2050 should remain human-centered. Technological progress should not create greater inequality or replace the importance of human relationships, creativity, empathy, and ethical responsibility. Digital privacy and cybersecurity will become increasingly important as more aspects of life become connected. People should have greater awareness of how their data is collected and used,

while organizations should develop technology with transparency, security, and accountability. Bridging the digital divide will also be essential so that technological progress benefits communities across different economic and geographic backgrounds.

For the younger generation, the world of 2050 will provide enormous opportunities for innovation. Students and young professionals will be able to work with technologies that are still emerging today, including advanced Artificial Intelligence, robotics, quantum computing, biotechnology, and intelligent autonomous systems. As a Computer Science and Engineering student, I envision a future where technology is used not only to create faster machines and smarter software but also to solve meaningful problems in healthcare, education, sustainability, agriculture, and society.

My vision for 2050 is therefore not simply a world filled with futuristic machines. It is a world where technology serves humanity, innovation supports sustainability, education is accessible to everyone, healthcare is more preventive and personalized, and development is inclusive. The future will be shaped by the decisions we make today. If we combine technological innovation with responsibility, empathy, environmental awareness, and ethical thinking, 2050 can become more than a technologically advanced future—it can become a future where people and the planet can thrive together.

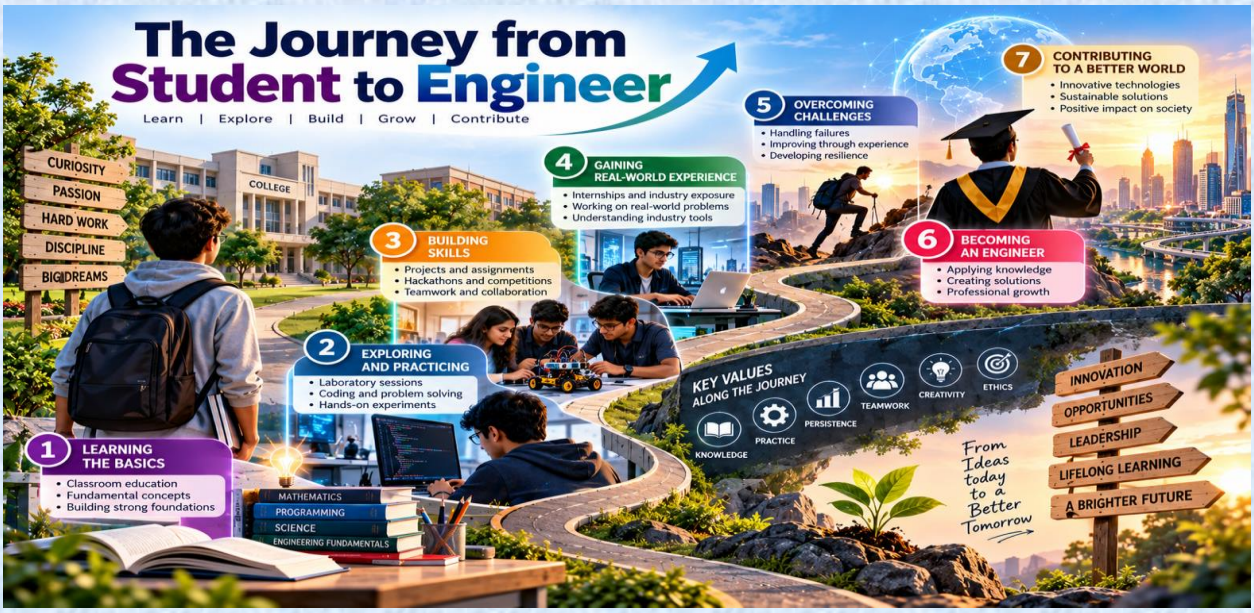
AITIJHYA PANDEY
3rd Year, CSE

The Journey from Student to Engineer

The journey from being a student to becoming an engineer is much more than completing a degree. It is a journey of learning, experimentation, challenges, failures, and personal growth. A student enters an engineering institution with curiosity and dreams, but gradually learns to transform ideas into practical solutions. The classroom provides fundamental knowledge in mathematics, science, programming, and engineering principles, while laboratories, projects, internships, competitions, and teamwork provide opportunities to apply that knowledge to real-world problems. Every assignment, examination, project, and challenge becomes a stepping stone toward developing technical skills and professional confidence.

In the early stages, students often focus mainly on understanding theoretical concepts. As they progress, they begin to realize that engineering is about applying knowledge to solve practical problems. A Computer Science student, for example, may begin with programming fundamentals and gradually explore data structures, databases, computer networks, operating systems, Artificial Intelligence, cybersecurity, and emerging

technologies. Writing a program that does not work, debugging it repeatedly, and finally finding the solution teaches lessons that cannot always be learned from textbooks. These experiences develop patience, logical thinking, creativity, and problem-solving abilities.



One of the most important stages of the engineering journey is learning beyond the classroom. Technology changes rapidly, and engineers must continuously update their knowledge. Online courses, technical workshops, research papers, hackathons, internships, coding platforms, conferences, and professional communities can help students explore new areas and understand industry requirements. Working on real-world projects also teaches students how to identify a problem, analyze possible solutions, work within constraints, collaborate with others, and present their ideas effectively. These experiences gradually transform theoretical knowledge into practical expertise.

The journey is not always easy. Students may face difficult subjects, unsuccessful projects, programming errors, academic pressure, uncertainty about career choices, and failures in competitions or interviews. However, failure is an important part of engineering education. A failed experiment can reveal what needs to be improved, while an unsuccessful project can teach valuable lessons about planning, testing, teamwork, and perseverance. Engineers are expected to approach problems systematically rather than give up when the first solution does not work. Every challenge can therefore become an opportunity to learn and improve.

Another important part of becoming an engineer is developing soft skills and professional values. Technical knowledge alone is not sufficient. Engineers must

communicate ideas clearly, work effectively in teams, manage time, understand professional responsibilities, and make ethical decisions. Leadership, creativity, adaptability, critical thinking, and empathy are equally important in solving complex problems. An engineer may design a technically advanced system, but its real value depends on whether it is safe, accessible, sustainable, and useful to society.

For students of Computer Science and Engineering, the future offers exciting possibilities in areas such as Artificial Intelligence, Machine Learning, Data Science, Cloud Computing, Cybersecurity, Robotics, Blockchain, Quantum Computing, and Software Engineering. However, becoming a successful engineer is not simply about learning the latest technology. It is about developing the ability to learn continuously and use technology responsibly to address meaningful problems. The engineer of tomorrow must be both a technologist and a problem solver.

Ultimately, the journey from student to engineer is a transformation from learning concepts to creating solutions. It begins with curiosity, develops through education and experience, and grows through challenges and continuous learning. The degree may mark the completion of formal education, but engineering itself is a lifelong journey. Every student has the opportunity to become an engineer who not only builds innovative technologies but also contributes positively to society. The journey may be filled with challenges, but with knowledge, perseverance, creativity, and responsibility, every step can lead toward a meaningful and successful engineering career.

NAMRATA SINGH
3rd Year, CSE

The Role of Teamwork in Engineering

Engineering is often associated with technical knowledge, mathematics, programming, and problem-solving, but successful engineering projects rarely depend on the work of a single individual. Teamwork is one of the most important skills for an engineer, because modern challenges are complex and often require people with different areas of expertise to work together. Whether developing software, designing a bridge, building a robot, creating a medical device, or developing an Artificial Intelligence system, engineers must communicate ideas, share responsibilities, solve problems collectively, and work toward a common goal.

A successful engineering team brings together people with different skills, experiences, and perspectives. One member may specialize in programming, another in hardware, another in data analysis, while someone else may focus on design, testing,

documentation, or project management. When these abilities are combined effectively, the team can approach a problem from multiple perspectives and develop more complete solutions. Diversity of ideas can also encourage creativity and help identify potential problems that one person might overlook.



Communication is at the heart of effective teamwork. Engineers need to explain technical concepts clearly, listen to suggestions, ask questions, and provide constructive feedback. Miscommunication can lead to errors, delays, and conflicts, while clear communication helps team members understand their responsibilities and coordinate their work. Modern engineering projects often involve people from different departments, organizations, and even countries, making communication and collaboration increasingly important.

Teamwork also teaches engineers how to manage challenges and disagreements. Different team members may have different opinions about how a problem should be solved. Instead of treating disagreement as an obstacle, effective teams use discussion, evidence, experimentation, and mutual respect to evaluate different ideas. Learning to accept constructive criticism and recognize the contributions of others helps create a positive working environment. Team members also learn that the success of a project is more important than individual recognition.

For Computer Science and Engineering students, teamwork is particularly important because software and technology projects are rarely developed by one person from beginning to end. Students may collaborate on programming projects, hackathons, research activities, Artificial Intelligence applications, cybersecurity systems, mobile applications, and robotics projects. Using tools such as version-control systems, collaborative platforms, project-management tools, and communication applications

allows teams to work efficiently even when members are working from different locations.

Teamwork also develops important leadership and professional skills. A good team member understands when to lead and when to support others. Leadership does not always mean giving instructions; it can involve motivating teammates, taking responsibility, helping solve difficulties, and ensuring that everyone has an opportunity to contribute. At the same time, responsible team members complete their assigned tasks on time and understand how their work affects the overall project.

The importance of teamwork extends beyond academic projects into professional engineering careers. Engineers frequently collaborate with researchers, designers, managers, customers, technicians, and professionals from other disciplines. Large-scale projects such as smart cities, renewable-energy systems, space missions, healthcare technologies, and advanced software platforms require coordinated efforts from many people. The ability to collaborate effectively can therefore be just as important as technical expertise.

Ultimately, great engineering is rarely a solo achievement. It is the result of people combining knowledge, creativity, experience, and effort to solve meaningful problems. For students preparing to become engineers, learning to work effectively with others is an essential part of professional development. By communicating openly, respecting different perspectives, sharing responsibilities, and supporting one another, engineering teams can transform ideas into practical solutions. In the world of engineering, individual talent may start an idea, but teamwork helps turn that idea into reality.

RITAM MONDAL
2nd Year, CSE

Code, Coffee and College

College life in Computer Science and Engineering is a unique combination of learning, coding, deadlines, friendships, and countless cups of coffee. For many students, a typical day begins with lectures and ends with programming assignments, project discussions, or late-night debugging. Between classes, students exchange ideas, work on projects, attend technical events, and try to understand why a program that worked perfectly a few minutes ago has suddenly stopped working. This combination of academics and everyday experiences makes engineering college much more than a place to earn a degree—it becomes a journey of discovery, experimentation, and personal growth.

Coding gradually becomes an important part of this journey. What may initially look like a collection of unfamiliar symbols and complicated syntax eventually becomes a powerful way to express ideas and solve problems. Students begin with simple programs and gradually explore data structures, algorithms, databases, web development, Artificial Intelligence, cybersecurity, cloud computing, and software engineering. Every error message becomes a small lesson, and every successfully executed program brings a sense of achievement. Debugging teaches patience, logical thinking, and the importance of looking at a problem from different perspectives.



But college is not only about code. It is also about people and experiences. Friends become teammates during assignments, partners during hackathons, and sometimes the only reason a difficult project is completed before the deadline. Discussions can begin with a programming problem and unexpectedly turn into conversations about careers, startups, technology, movies, music, or life. The college cafeteria or a small coffee shop often becomes an informal meeting room where ideas are exchanged, projects are planned, and memories are created.

Coffee, in this story, is more than just a beverage—it represents those moments between "I have no idea how to solve this" and "I finally figured it out." It accompanies early-morning classes, afternoon brainstorming sessions, evening project work, and late-night preparation before submissions. Of course, the real fuel behind a student's progress is not coffee but curiosity, determination, friendship, and the willingness to keep learning. Sometimes the most memorable college moments happen not during a lecture but while sitting with friends, solving a problem together and laughing at the mistakes made along the way.

College also provides opportunities to discover interests beyond the syllabus. Hackathons, coding competitions, technical clubs, internships, research projects, workshops, seminars, cultural activities, and entrepreneurship events allow students to experiment with new ideas. A simple classroom project can sometimes become the starting point for a larger innovation. Working on such activities helps students develop communication, teamwork, creativity, leadership, and problem-solving skills alongside technical knowledge.

There will inevitably be difficult days—unfinished assignments, failed programs, confusing subjects, project deadlines, examination pressure, and moments of self-doubt. Yet these challenges are part of the engineering experience. Students gradually learn that not every problem has an immediate solution and that asking for help is not a weakness. They learn to try again, search for answers, collaborate with friends, and improve their approach. These small lessons eventually build confidence and resilience.

The journey of Code, Coffee and College is therefore not simply about programming and academics. It is about the people we meet, the mistakes we make, the ideas we create, and the memories we carry forward. Years later, students may forget some examination questions or lines of code, but they are likely to remember the laughter during project work, the excitement of completing a difficult program, the nervousness before a presentation, and the conversations shared over a cup of coffee. College is where technical knowledge meets friendship, curiosity meets creativity, and challenges become experiences.

Ultimately, code may build our skills, coffee may keep us going, but college gives us the experiences that shape who we become. The journey may be filled with bugs, deadlines, sleepless nights, and countless cups of coffee, but it is also filled with learning, friendship, innovation, and unforgettable moments. And perhaps that is what makes engineering college such a memorable chapter of student life.

SHILADITYA ROY
2nd Year, CSE

Drones: Technology Above Us

Drones, also known as Unmanned Aerial Vehicles (UAVs), have transformed the way people observe, monitor, and interact with the world from the sky. Once primarily associated with military applications, drones are now becoming increasingly common in civilian and commercial fields. Equipped with cameras, sensors, GPS, communication systems, and intelligent software, drones can perform tasks that may be difficult,

dangerous, or expensive for humans. Their ability to fly autonomously or be remotely controlled has opened new possibilities in areas ranging from agriculture and photography to disaster management, logistics, environmental monitoring, and scientific research.

Modern drones combine several technologies, including Artificial Intelligence, computer vision, GPS, wireless communication, robotics, and sensor systems. Some advanced drones can recognize objects, follow predefined routes, avoid obstacles, capture high-resolution images, and collect environmental data. AI-powered computer vision can help drones analyze images and identify patterns or objects, while GPS and navigation systems allow them to determine their position and follow planned flight paths. These capabilities are making drones increasingly useful for both routine operations and complex missions.



One of the important applications of drones is agriculture. Farmers can use drones to survey large areas of farmland, monitor crop health, identify irrigation problems, and assess plant growth. Multispectral and thermal cameras can provide information that may not be visible to the human eye. Drone-based monitoring can help farmers make more informed decisions about irrigation, fertilization, and crop management. In the future, intelligent agricultural drones may perform more tasks autonomously, contributing to precision farming and efficient resource utilization.

Drones are also valuable in disaster management and emergency response. After floods, earthquakes, landslides, or other disasters, damaged areas may be difficult or unsafe for rescue teams to access. Drones can quickly survey affected regions, capture aerial images, locate possible survivors, and provide information to emergency-response teams. They

can also support infrastructure inspection by examining bridges, towers, power lines, and buildings without requiring workers to enter potentially dangerous locations.

Another rapidly developing area is drone delivery and logistics. Drones are being explored for transporting small packages, medical supplies, emergency equipment, and other lightweight goods. In remote or difficult-to-access locations, aerial delivery could reduce travel time and provide faster access to essential supplies. However, widespread drone delivery requires reliable navigation, air-traffic coordination, safety systems, appropriate regulations, and protection against unauthorized use.

Drones are also changing photography, filmmaking, surveying, and environmental research. Aerial cameras can capture perspectives that were previously possible only through helicopters or specialized aircraft. Surveying drones can create detailed maps and three-dimensional models of construction sites and landscapes. Environmental researchers can use drones to monitor forests, wildlife habitats, coastlines, and pollution. These applications demonstrate how drones can serve as powerful data-collection platforms rather than simply flying machines.

Despite their many benefits, drones also create challenges related to privacy, cybersecurity, safety, noise, regulation, and responsible use. Cameras and sensors can collect sensitive information, while unauthorized access to drone systems could create security risks. Drones operating near airports, crowded areas, or critical infrastructure must be carefully controlled to prevent accidents. Clear regulations and responsible operating practices are therefore essential for ensuring that drone technology develops safely.

For Computer Science and Engineering students, drones provide an exciting platform for exploring robotics, Artificial Intelligence, computer vision, embedded systems, IoT, machine learning, and autonomous navigation. Students can develop projects involving obstacle detection, object recognition, path planning, aerial image analysis, and autonomous flight simulation. Combining drones with AI can create innovative solutions for agriculture, smart cities, environmental monitoring, and emergency response.

Drones represent a fascinating example of how software, hardware, and intelligent systems can work together in the physical world. As autonomous navigation, AI, sensors, and communication technologies continue to improve, drones may become an increasingly important part of everyday infrastructure.

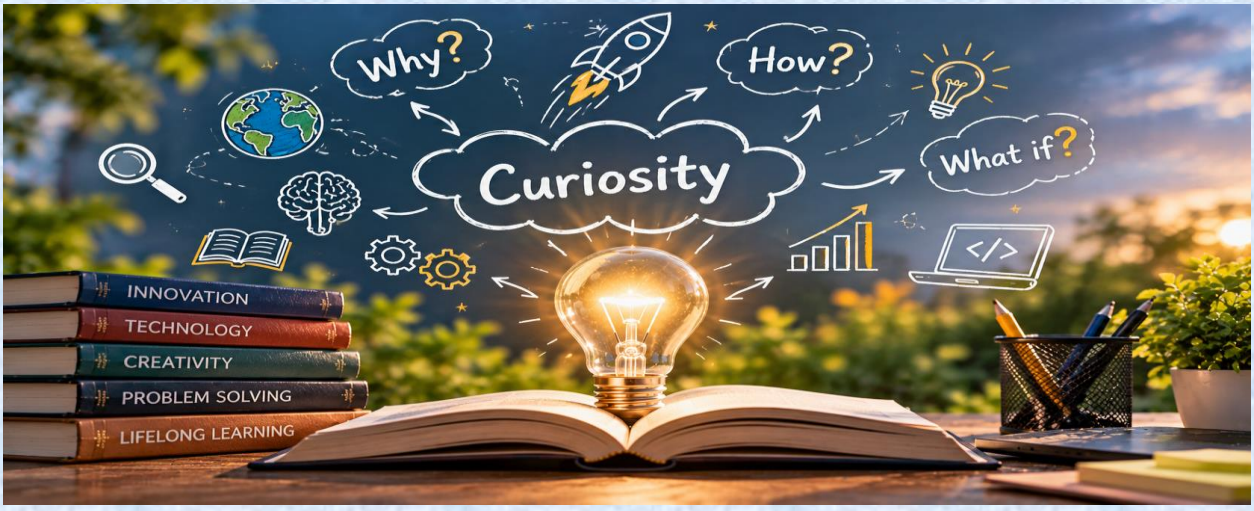
JAYITA DEBNATH

3rd Year, CSE

Why Curiosity Matters

Curiosity is one of the most powerful qualities that drives learning, creativity, discovery, and innovation. It begins with a simple question—*Why does this happen? How does it work? What if we try something different?*—and encourages us to explore beyond what we already know. For students, curiosity transforms education from simply reading textbooks and preparing for examinations into an exciting journey of exploration and discovery. A curious student does not stop at finding an answer but tries to understand the reason behind it.

In the field of Computer Science and Engineering, curiosity plays an especially important role. Technology is constantly changing, and new developments appear every day. A student's curiosity may begin with learning a programming language and gradually lead to exploring Artificial Intelligence, Machine Learning, Robotics, Cybersecurity, Data Science, Cloud Computing, or other emerging technologies. When students ask questions and experiment with new ideas, they develop stronger problem-solving and critical-thinking abilities.



Curiosity also encourages students to learn through experimentation. A program may not work on the first attempt, a project may produce unexpected results, or an experiment may fail completely. Instead of considering failure as the end, a curious mind asks, *"What went wrong?"* and *"How can I improve it?"* This attitude turns mistakes into valuable learning experiences. Many important discoveries and technological innovations have emerged through repeated experimentation, observation, and a willingness to try something new.

Another important role of curiosity is in creativity and innovation. Great ideas often begin by questioning existing methods. A student may look at an everyday problem and wonder whether technology could provide a better solution. This simple thought can lead to a project, research idea, startup, or even a new invention. Curiosity encourages students to look at familiar problems from unfamiliar perspectives and imagine possibilities that others may not have considered.

Curiosity is also essential for research and lifelong learning. Knowledge acquired during college provides a strong foundation, but technology and professional requirements continue to evolve. Engineers and researchers must constantly learn new concepts, tools, programming languages, and technologies. A curious person remains open to learning throughout life and does not hesitate to explore unfamiliar subjects. This habit can help students adapt to changing technologies and discover new areas of interest.

For students, curiosity can also develop important personal qualities such as confidence, patience, creativity, and independence. Searching for an answer requires effort and sometimes involves reading, experimenting, discussing ideas, and trying several approaches. Through this process, students gradually become more confident in solving problems independently. Curiosity also encourages them to ask questions without being afraid of making mistakes or admitting that they do not know something.

In today's rapidly developing technological world, curiosity can become the starting point for meaningful innovation. Technologies such as Artificial Intelligence, robotics, biotechnology, quantum computing, and the Internet of Things are creating new possibilities and new challenges. The engineers of tomorrow will need more than technical knowledge; they will need the imagination and curiosity to ask how these technologies can be used responsibly to improve healthcare, education, sustainability, agriculture, communication, and everyday life.

Ultimately, curiosity is not simply the desire to know more. It is the courage to question, the willingness to explore, and the imagination to discover new possibilities. Every student has questions, ideas, and the ability to explore them. A small question today may become a research project tomorrow, and that project may eventually become an innovation that makes a difference. As the saying goes, “Every great discovery begins with a question.” Therefore, students should never be afraid to ask *Why?*, *How?*, and most importantly, “What if?”

SUCHI SUBHRA JANA
2nd Year, CSE