

BCREC

# InnovIT

From a Noob to a Veteran

The Blueprint of Future Tech

*Coding the future one byte at a time.*



**DR. B. C. ROY**  
**ENGINEERING COLLEGE**  
DURGAPUR






Issue #01 | May 2026

**Dr. B. C. Roy Engineering College**  
Durgapur, West Bengal

# Table of Contents


















## Editorial

 1. Editorial Board	 2. Principal's Note	 3 & 4. Welcome Note
---	--	--








## BCREC @ 25

 5. A Glimpse of the Silver Jubilee Journey	 6. Chief Guests & Key Speakers	 7. Industry & Academic Speakers
 8. Awardees & Honorees	 9. Core Institutional Dignitaries	 10. BCREC @ 25 – Major Milestones













## Features & Analysis

 11. Navigating India's Intelligent India Transition	 12. The New Era of Intelligent India	 13. The Rise of Context Engineering
 14. From Coding to Context	 15. What is Context Engineering?	 16. Why Context Matters in AI Systems
 17. The Evolution of Engineering Roles	 18. Context Engineering in the Real World	 19. Context Engineering and the Future of Software Development
 20. The Skills Engineers Must Develop	 21. A Message for Future Engineers	 22. The Future of Engineering Careers in the AI Era
 23. Inside the Modern Smart Campus	 24. Industry Radar – India's Trusted IT Publications	 25. Mechanistic Interpretability
 26. Sovereign AI – India's Strategy for Digital Independence	 27. Trend Watch – Technology Trends Defining 2026	

## Campus & Innovation

 28. Buyer's Guide – AI Native Hardware Checklist	 29. Research and Development at BCREC	 30. Labs and Incubation at BCREC
 31. Intellectual Property Achievements	 32. BCREC Engineering & Science Transaction (BEST)	 33. Google Workspace for BCREC
 34. BCREC IT Infrastructure Overview		

## Tech & Closing

 35. The TA's Guide to Cyber Hygiene	 36. The TA's Role in Digital Structural Integrity	 37. Cyber Hygiene – Phishing & The Swiss Cheese Model
 38. System Administration in the Era of Agentic AI	 39. From "God Mode" to "Guardrails" – The New Stack	 40. The "Hallucination" Tax & The Verdict
 41. The Fun Byte – Debugging Challenge	 42. The Fun Byte – Crossword Challenge	 43. The Fun Byte – Answer Key
 44. Trending Interview Questions – 2026 Edition	 45. Digital Defense: Your Essential Guide to Online Safety	 46. Closing Note

# Editorial Board

## Chief Editor

### BCREC InnovIT Editorial Team

Avhishek Mukherjee

Indranil Sengupta

---

## Faculty Advisors

**Dr. Abhijit Banerjee**

Faculty Members – BCREC

---

## Contributors

Technical Administration Team

Soumitra Goswami - PR Team

Student Contributors

---

## Published By

**Dr. B. C. Roy Engineering College**

Durgapur, West Bengal



# Principal's Note

“BCREC  
InnovIT”

Technical  
magazine ·  
First edition

Congratulations to the Team of “BCREC InnovIT” bringing up one more technical magazine in the campus.

I am happy to hear about the publication of one more technical magazine at our Institute, “BCREC InnovIT”. It's a pleasure for me to write the message for its first edition. BCREC being in Engineering and Technology Education, there is vast scope for almost all the students, faculties and even non-teaching staff to contribute to the information in technology to all BCREC members.

The topics may be an experience of dealing with Cyber Scam – its stories and precautions, an update of AI apps – its pros and cons, education tools for the faculties, learning tools for students, information about freelancing and earn-and-learn opportunities for students, successful writing of Research proposals, and non-technical applications of AI for day-to-day use.

The magazine is the best opportunity for all to contribute and should also be a learning means for newcomers. The scope is large, the topics are infinite – but the selection should be what I need, what the Institute needs, and what society needs. The priority should be in working in these directions.

There are many technical issues, problems, challenges and services to be offered at the Institute level also. The contribution should come from all classes of people and even consumption should be for all classes.

I think one special chapter or section should be dedicated to topics which are not yet available but in future can be designed and developed. This could inspire curiosity amongst all the stakeholders and start thinking for solutions to future problems. The magazine can be a media to advertise it and gather together like-minded people in the area to work on solutions.

As the need and demand will increase, I am sure the frequency of publication needs to be increased.

Once again, congratulations to the “BCREC InnovIT” team and best wishes for the future.

---

**Prof (Dr) Sanjay S Pawar**  
Principal

# Welcome Note

Dear Readers,

It is with immense pride and excitement that we present the inaugural issue of **BCREC InnovIT**, the official technical magazine of Dr. B. C. Roy Engineering College.

Our institution has always aspired to become a **Global Centre of Learning**, and InnovIT represents another step in that journey.

Whether you are writing your first Hello World, exploring Artificial Intelligence, or researching advanced technologies, this magazine aims to inspire curiosity and innovation.

In this inaugural issue, you can expect a rich mix of content designed to reflect the vast breadth of engineering today. We have curated a collection of feature articles, technical spotlights, campus innovations, and student perspectives that highlight the passion and ingenuity defining our community.

This project is a collective achievement, and we extend our deepest gratitude to everyone involved. From the faculty advisors whose guidance shaped our vision, to the editorial team and the talented students whose hard work, ideas, and relentless energy brought this publication to life, thank you for making this dream a reality.

Ultimately, InnovIT is not just a magazine—it is a platform. It is a dedicated space where ideas are shared, challenging questions are asked, and the next generation of engineers finds its voice. We sincerely hope it becomes a companion that you look forward to reading with every issue.

With warm regards,

The BCREC InnovIT Editorial Team



# Welcome Note — Our Mission

Through this platform we aim to:



## Bridge the Gap

Bridge the gap between classroom learning and industry reality



## Showcase Innovation

Showcase student innovation and research



## Share Insights

Share insights from faculty, technical teams, and alumni

*Innovation is not just about building technology – it is about the synergic application of creativity and discipline.*

**Read. Learn. Innovate.**

Editorial Team  
BCREC InnovIT

# A Glimpse of the Silver Jubilee Journey

Dr. B. C. Roy Engineering College proudly celebrates 25 years of excellence in engineering education. Over the past two and a half decades, the institution has forged a distinguished legacy of academic excellence, innovation, and industry engagement.

**DR. B.C. ROY ENGINEERING COLLEGE, DURGAPUR**

**YEAR IN REVIEW - 2024-2025**

**Nov 27, 2024 (MARS ORBITER MISSION)**  
 PADMA SHRI DR. SUBBIAH ARUNAN  
 CHIEF GUEST: MARS ORBITER MISSION INDIA

**Feb 21, 2025 (GLOBAL ICT SEMINAR)**  
 SHRI SANJAY CHATTERJEE  
 CHIEF GUEST: NASSCOM REGIONAL COUNCIL, EAST

**Feb 27, 2025 (DUAL SEMINARS)**  
 SPACE EXPLORATION: DR. GOUTAM CHATTOPAHAY, NASA JPL  
 COMMUNICATION TRIBUTE: PROF. BHASKAR GUPTA

**Mar 26, 2025 (ECHOS OF ADVENTURE)**  
 SAYANI DAS SWIMMER, 6 CHANNELS WINNER  
 UDAY KUMAR ONE LEG MOUNTAINEER, KILIMANJARO CLIMBER

**Apr 7, 2025 (WORLD HEALTH DAY)**  
 TECHNOLOGY IN HEALTH CARE

**May 2, 2025 (SARBOTTOM NAGARIK SAMMAN)**  
 GURBUX SINGH  
 JHULAN COSWAMI

**May 22, 2025 (KRITI SAMMAN - EDUCATORS)**  
 KRITI SAMMAN - EDUCATORS

**Jun 13, 2025 (KRITI SAMMAN - SCIENCE)**  
 PADMASHAREE SHRI DUKHU MAJHI (Gach Baba)  
 PLANTERIS / SCIENCE/ENVIRONMENT AWARDEES

**Jul 1, 2025 (NATIONAL DOCTORS' DAY)**  
 DR. BIDYUT BARAN SENAPATI  
 DR. MALAY NANDI  
 SENIOR DOCTORS

**Jul 25, 2025 (HR CONCLAVE) WORKFORCE 2030**  
 HR Manager Cognizant, HR Manager Citicorp, ITO Manager Coltcat, HR Manager Xerox, HR Manager Cognizant, HR Manager Cognizant, HR Manager Cognizant, HR Manager Cognizant, HR Manager Cognizant, HR Manager Cognizant

**Aug 4, 2025 (EDUCATION CONCLAVE)**  
 EDUCATION CONCLAVE  
 11. SCHOOL PRINCIPAL, 12. SCHOOL PRINCIPALS COORDINATOR, 13. ANNEEL PRINCIPAL, 14. ACHARYA RAJAN, 15. ACHARYA RAJAN, 16. RIMAY RASBIBIBAN, 18. ANANDALY CHAKRABORTY

**Aug 20, 2025 (GRAND CONCLUDING CEREMONY)**  
 SONAM WANCHUK (Magsaysay Awardee)  
 MR. ARUP RAHA (Air Chief Marshal, Retd.)  
 PANDIT AJOY CHAKRABORTY (Classical Vocab)

# Chief Guests & Key Speakers

Esteemed luminaries who graced the Silver Jubilee events as chief guests and keynote speakers.



**Padma Shri Dr. Subbiah Arunan**

Project Director,  
Mars Orbiter  
Mission India



**Shri Sanjay Chatterjee**

Chair, NASSCOM  
Regional Council,  
East



**Dr. Goutam Chattopadhyay**

Senior Scientist,  
NASA JPL



**Prof. Bhaskar Gupta**

Vice Chancellor,  
Jadavpur University



**Sayani Das**

Open Water  
Swimmer, Six  
Oceanic Channels  
Winner



**Uday Kumar**

One-Leg  
Mountaineer, Mt.  
Kilimanjaro Climber



**Dr. Sunil Chandy**

Chief Medical  
Officer, ITC India;  
Former Director,  
CMC Vellore



**Shri Dukhu Majhi (Gach Baba)**

Environmentalist



**Dr. Bidyut Baran Senapati**

Senior General  
Physician



**Dr. Malay Nandi**

Senior Child  
Specialist



**Sonam Wangchuk**

Ramon Magsaysay  
Awardee,  
Educational  
Reformist



**Mr. Arup Raha**

Chancellor, Assam  
University & Former  
Air Chief Marshal



**Pandit Ajoy Chakraborty**

Classical Vocalist

# Industry & Academic Speakers

Subject matter experts who led the HR Conclave and Education Conclave during the Silver Jubilee year.

## HR Conclave — Workforce 2030

(25th July 2025)

**Avik Chakraborty**

Cognizant

**Sharthak Acharjee**

Celebal Tech

**Rituparna Dhar**

LTI-Mindtree

**Anushka Ghosh**

LTI-Mindtree

**Srikanth Gedala**

DVC DSTPS

**Anurag Kirti**

Xerox-Lexmark

**Supratik Mukherji**

MPL

**Pramod Kumar Swain**

Supreme Industries

**Supratim Sinha**

Adhunik

## Education Conclave

(4th August 2025)

**Raj Paulson Sekhar**

Jainul Haque

**Prashant Kumar**

**Subhendu Mukherjee**

**Dr. Moumita Chatterjee**

**Dr. Debnath Palit**

**Vivekananda Mukherjee**

**Subrata Chattopadhyay**

**Rajib Chatterjee**

**Yashika Pahwa**

**Supriyo Roy**

**Kuntala Paul**

# Awardees & Honorees

Celebrated individuals honoured by BCREC during the Silver Jubilee year for their outstanding contributions.

## Sports Legends



Gurbux Singh — Hockey



Subrata Bhattacharya — Football



Jhulan Goswami — Cricket



Dola Banerjee — Archery



Soma Biswas — Athletics



Sayani Das — Ocean Swimming

## Education & Science



Dr. Sushil Bhattacharya



Ms. Papia Mukherjee



Dr. Kalimul Haque



Mr. Ramesh Rakshit



Dr. Subhabrata Roychaudhuri



Dr. Tapan Saha



Kallol Ghosh



Shri Shyama Pada Bandyopadhyay — Gach Dadu



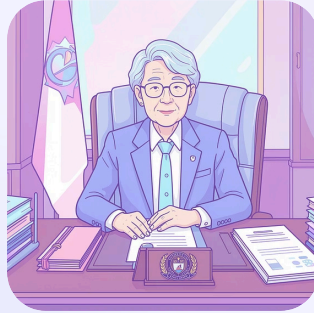
Shri Dukhu Majhi — Gach Baba

# Core Institutional Dignitaries

The leadership and administration of BCREC whose consistent presence anchored every Silver Jubilee event.



**Dr. Satyajit Bose**



**Mr. Tarun Bhattacharya**



**Mr. Jernail Singh**



**Dr. Sanjay S. Pawar**



**Mrs. Mita Mitra**



**Dr. Rajib Roy**



**Shri S. Ponnambalam**

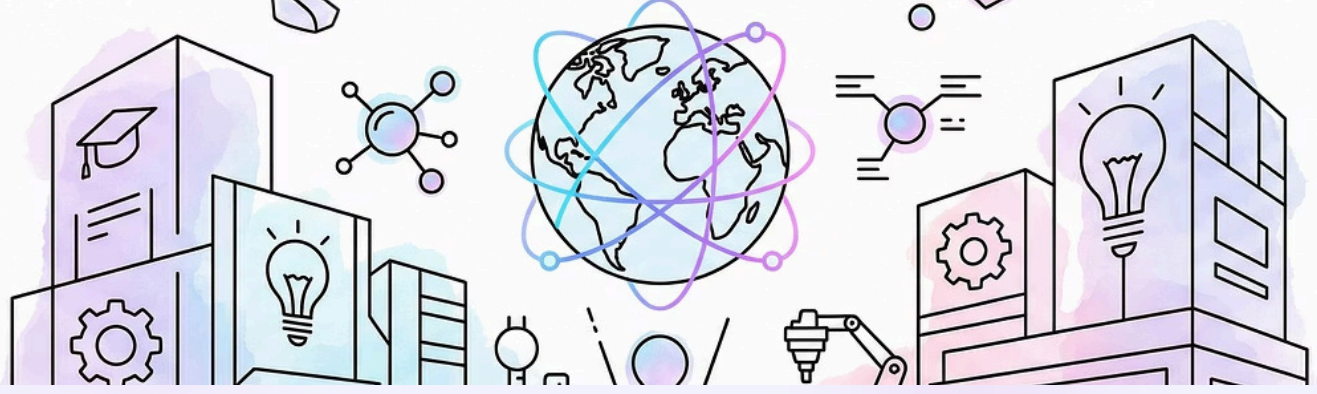
IAS, District Magistrate



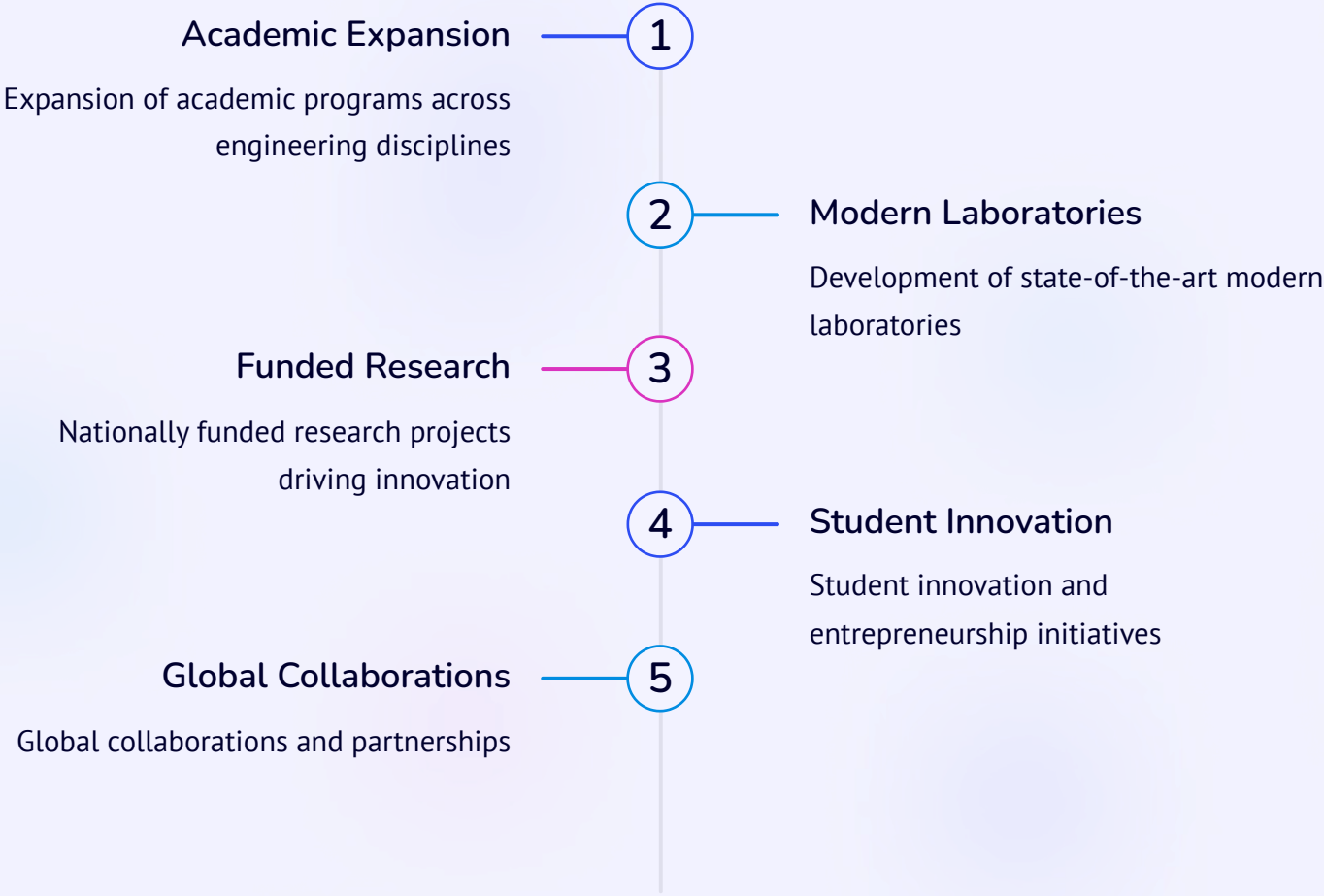
**Dr. Sourav Chatterjee**

WBCS, Sub-Divisional Magistrate

*Their unwavering dedication and leadership made the Silver Jubilee a landmark celebration in the history of BCREC.*



# BCREC @ 25 — Major Milestones



As BCREC moves forward into the next phase of its journey, the institution remains committed to building **future-ready engineers and innovators**.

# Navigating India's Intelligent India Transition

We are currently witnessing what many technology leaders describe as the **Third Tech Wave**—a transformative period where Artificial Intelligence, advanced computing, and large-scale data infrastructure are reshaping nearly every industry.

India stands at the forefront of this technological transformation and is rapidly moving toward what experts describe as "**Intelligent India.**"



**\$1...**

AI GDP Contribution by 2035

*Source: NITI Aayog, 'AI for Viksit Bharat', Sep 2025*

**99%**

Enterprises Increasing AI Investment

*Source: Lenovo CIO Playbook 2026 / IDC, Mar 2026*

**3rd**

Global AI Vibrancy Rank

*Source: Stanford HAI / PIB, Feb 2026*

**\$67.5...**

AI Infrastructure Commitment

*Source: TechDodo / multiple sources, Dec 2025*



# The New Era of Intelligent India

This new era is defined by:



## AI-Driven Innovation

Artificial intelligence powering every sector



## Domestic Technology Ecosystems

Homegrown platforms and solutions



## Digital Public Infrastructure

Scalable national digital frameworks



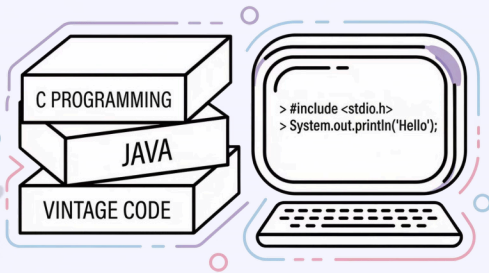
## Advanced Research Capabilities

World-class R&D institutions and programs

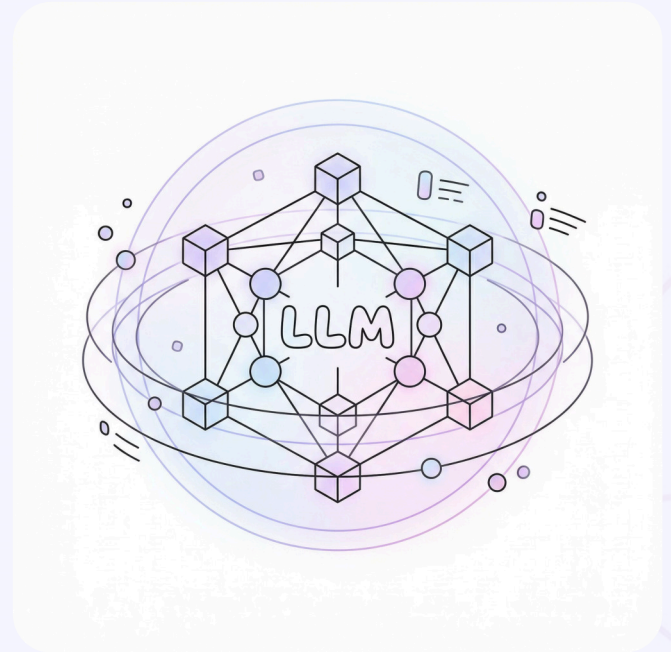
For engineers, the future requires not only technical expertise but also **context awareness, ethical responsibility, and interdisciplinary thinking**. Engineering today is not just about writing code—it is about designing systems that solve real-world problems.

# The Rise of Context Engineering

The Most Important Skill of the AI Era



For decades, the core skill of an engineer was clear: write efficient code and build reliable systems. From the early days of programming languages like C and Java to modern full-stack development frameworks, the ability to translate human logic into machine instructions defined technical excellence.



However, the rapid advancement of Artificial Intelligence and Large Language Models (LLMs) is transforming the way software is designed and built. In this new technological landscape, engineers are discovering that the most valuable skill is no longer simply writing code—it is **designing the context in which intelligent systems operate.**

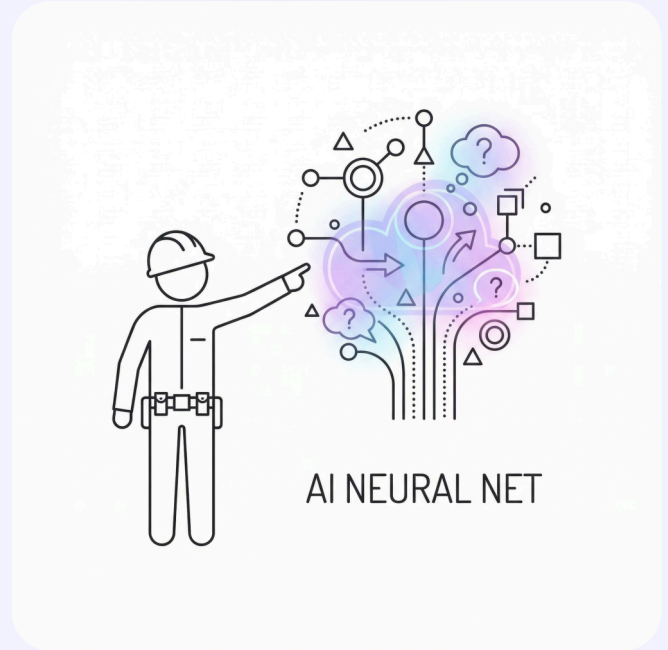
This emerging discipline is known as **Context Engineering.**

# From Coding to Context



## Traditional Programming

Traditional programming required developers to specify exact instructions for a computer to follow. Every step had to be carefully defined, and even minor errors could cause a program to fail.

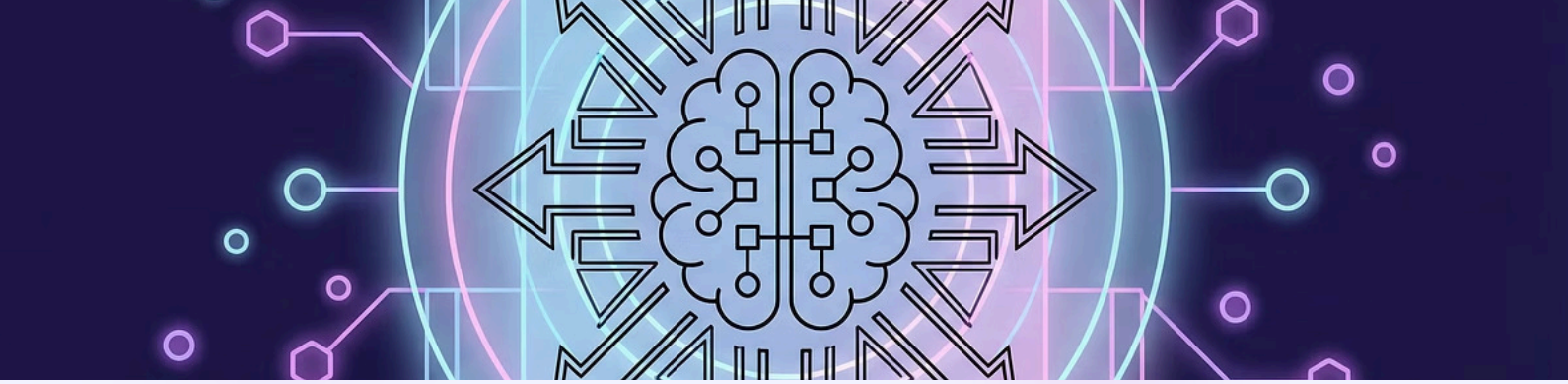


## AI-Driven Engineering

Artificial Intelligence systems work differently.

Modern AI models learn patterns from massive datasets and generate responses based on probabilities. Instead of telling the machine exactly how to perform a task, engineers must now guide the system by providing clear instructions, relevant data, and meaningful constraints.

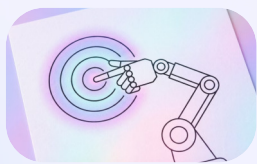
In other words, engineers are shifting from **writing instructions** to **designing environments** where AI systems can make intelligent decisions. This transition marks a fundamental change in the engineering mindset.



# What is Context Engineering?

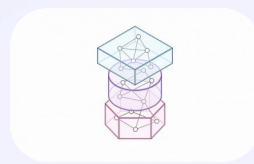
Context Engineering refers to the process of structuring information, constraints, goals, and data inputs so that AI systems can perform tasks accurately and reliably.

It involves designing the "context" that surrounds a problem so that an AI system understands:



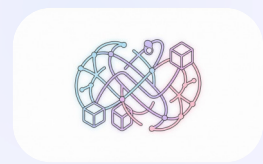
## What the objective is

Clearly defining the goal the AI system must achieve



## What information it should use

Specifying the relevant data and knowledge sources



## What rules it must follow

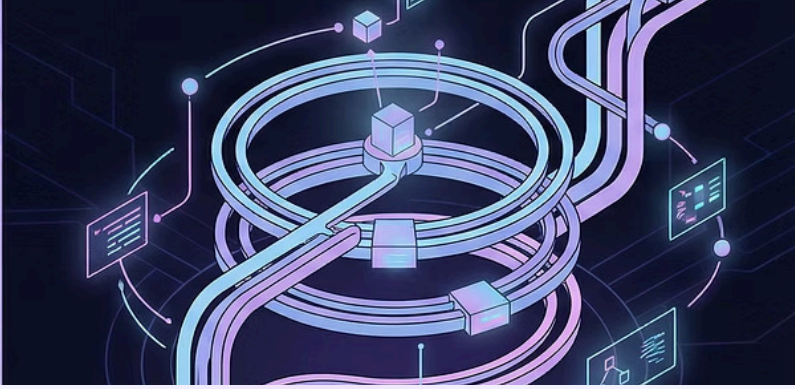
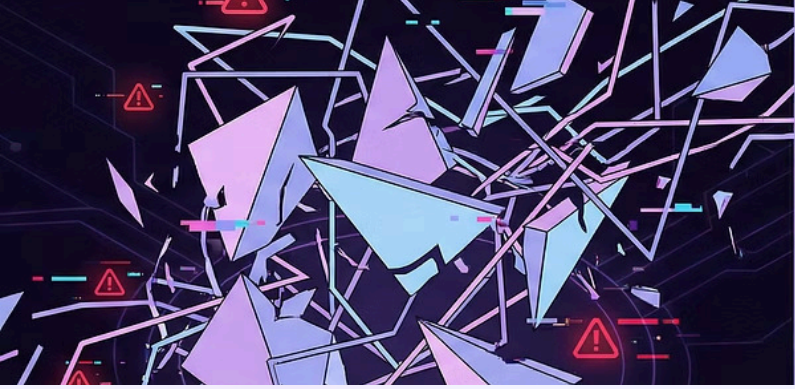
Establishing constraints and operational boundaries



## What outcomes are acceptable

Defining success criteria and acceptable output formats

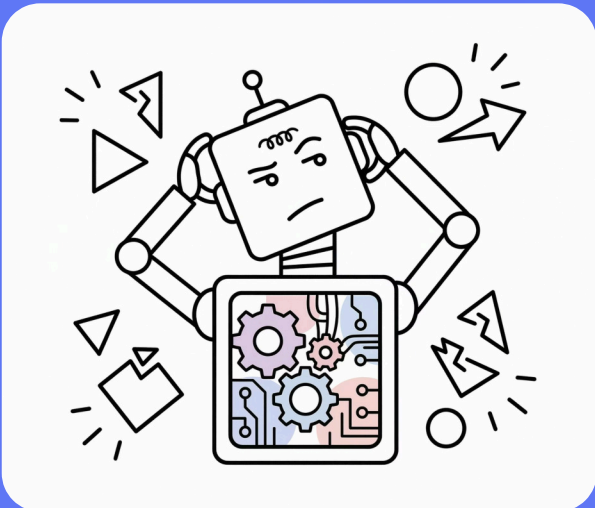
When the context is well designed, AI systems can perform complex tasks with remarkable efficiency. When the context is poorly defined, even the most powerful AI model can produce unreliable or misleading results.



# Why Context Matters in AI Systems

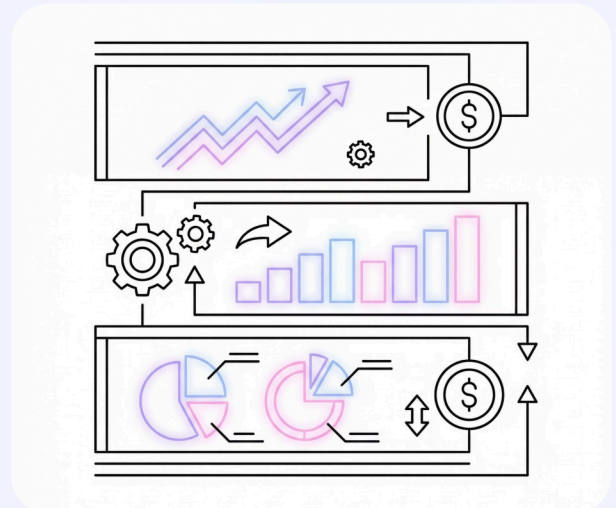
AI models are powerful but not inherently intelligent in the human sense. They depend heavily on the quality of the information and instructions they receive.

A poorly structured prompt or incomplete dataset can cause an AI system to:



## Problems Without Context

- Produce incorrect outputs
- Misinterpret instructions
- Generate biased or misleading results
- Fail to meet operational requirements



## Example: Financial Data Analysis

Instead of simply asking an AI system to "analyze financial data," a well-designed context might include:

- The specific dataset to analyze
- The time period of interest
- The financial indicators to evaluate
- The format of the final report

This additional context significantly improves the reliability and usefulness of the AI's response.



# The Evolution of Engineering Roles

As AI becomes integrated into modern systems, the responsibilities of engineers are evolving. Traditional roles focused primarily on coding and system design. In contrast, engineers working with AI must now focus on:

**PROBLEM DEFINITION**

**Problem Framing**  
 Defining the problem clearly so that AI systems understand the objective.

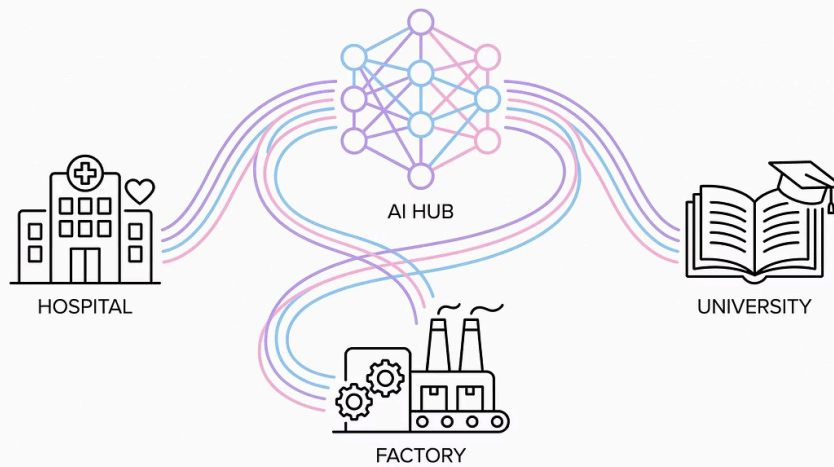
**Data Structuring**  
 Preparing high-quality datasets that enable accurate learning and analysis.

**Prompt Design**  
 Creating effective instructions and prompts that guide AI systems toward meaningful outputs.

**AI GOVERNANCE**

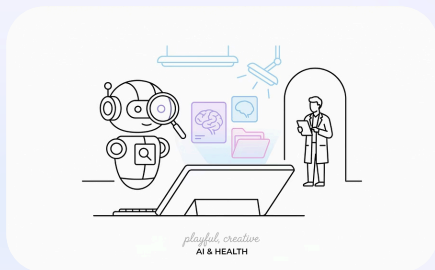
**System Governance**  
 Ensuring that AI systems operate within ethical, legal, and operational boundaries.

These responsibilities require a blend of **technical expertise, analytical thinking, and domain knowledge.**



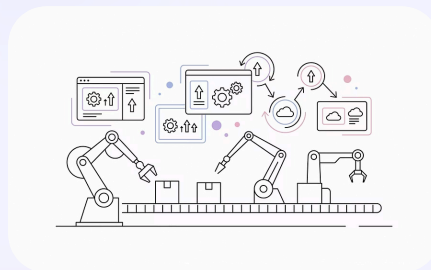
# Context Engineering in the Real World

Context Engineering is no longer theoretical; it is actively redefining how AI systems are deployed across the most demanding industries.



## Healthcare

Beyond simple diagnostics, AI systems in clinical settings must synthesize disparate medical records, rigorous guidelines, and nuanced patient histories. Precision is non-negotiable; engineers must architect the context layer to ensure every recommendation meets the highest standards of diagnostic accuracy.



## Manufacturing

Modern industrial efficiency hinges on the AI's ability to decode complex logistical environments. By masterfully engineering operational context, developers enable these systems to command resource constraints and shifting demand patterns with intelligence that transcends traditional automation.



## Education

Adaptive learning platforms represent a shift toward hyper-personalized intelligence. This transformation is driven by the context layer, which curates the flow of pedagogical material by precisely interpreting a student's cognitive progress and specific skill-based requirements.

Ultimately, the performance of these AI systems is not merely a function of their underlying models, but a direct result of how rigorously engineers architect the surrounding context.

# Context Engineering and the Future of Software Development

As AI tools become more advanced, software development itself is evolving. Developers are increasingly working with AI copilots and automated coding assistants that can generate code, debug programs, and suggest improvements.

This shift allows engineers to focus less on repetitive coding tasks and more on high-level system design and problem solving.

Coding will remain important, but the ability to define context will become equally critical.



## System Architecture

Designing robust, scalable architectures that AI systems can navigate intelligently.



## Operational Goals

Defining clear objectives that guide AI behavior across complex workflows.



## Data Pipelines

Structuring the flow of information that feeds AI systems with the right context.

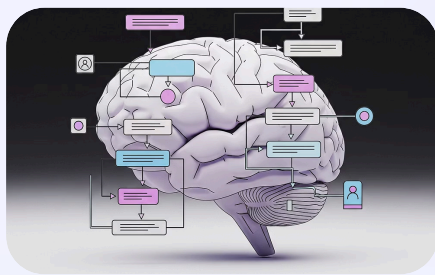


## AI Ethics & Guidelines

Establishing the guardrails that ensure AI systems operate responsibly.

# The Skills Engineers Must Develop

To succeed in the era of AI, engineers must cultivate a broader skill set.



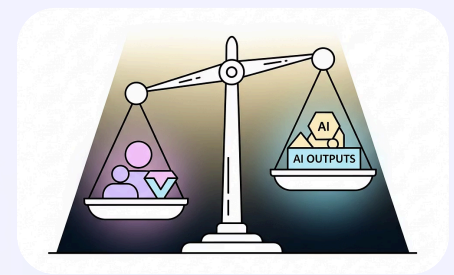
## Critical Thinking

Understanding how to break complex problems into structured tasks that AI systems can solve.



## Data Literacy

Working effectively with datasets, data pipelines, and data governance frameworks.



## Ethical Awareness

Ensuring that AI systems operate responsibly and do not produce harmful outcomes.



## Interdisciplinary Collaboration

Working with experts from fields such as healthcare, economics, and social sciences to design meaningful solutions.

These capabilities will define the **next generation of engineering leadership**.



# A Message for Future Engineers

For students entering the engineering profession today, the rise of Context Engineering presents both a **challenge and an opportunity**.

Technology is evolving at an unprecedented pace, and the engineers who succeed will be those who can adapt, learn continuously, and think beyond traditional boundaries.

In this rapidly shifting landscape, technical proficiency is merely the foundation, not the finish line. The true test of your capability lies in your willingness to treat learning as a lifelong practice rather than a transient phase that concludes at graduation. By embracing an iterative approach to your own expertise, you ensure that your skills remain as dynamic as the technologies you build.

## Stay Curious

Always ask why systems work the way they do, and how they could work better.

## Build Responsibly

Every system you design will affect real people. Responsibility is not optional.

## Think in Systems

The most valuable engineers see not just the code, but the entire ecosystem it operates within.

Ultimately, the engineering profession is not just a career—it is a profound responsibility. Those who enter it today carry the singular privilege of shaping the world that billions of people will inhabit in the decades to come. That is not a small thing; it is the quiet, essential work of progress.

**The engineers of tomorrow will not simply build machines – they will shape the digital environments in which intelligence operates.**



FEATURE ARTICLE

## The Future of Engineering Careers in the AI Era

Artificial Intelligence is no longer a peripheral technology; it is the central nervous system of the modern industrial revolution. As AI models transition from research curiosities to foundational infrastructure, the global job landscape is undergoing a profound metamorphosis. While the automation of routine technical tasks is inevitable, this shift is simultaneously acting as a catalyst for an unprecedented expansion in the scope of engineering.

For students and early-career professionals, this represents a unique inflection point. The pace of change is accelerating, shifting the requirement from simple procedural knowledge to architectural mastery. Navigating this future means moving beyond the role of a passive implementer toward becoming an active participant in the design of hybrid systems, where the synergy between human cognitive strengths and machine efficiency defines the new standard of productivity.



### AI Systems Architect

These visionaries design the blueprints for sophisticated AI frameworks and interconnected neural ecosystems. They ensure that complex systems are not only performant but also scalable, modular, and capable of evolving alongside new technological breakthroughs.



### Machine Learning Engineer

These specialists focus on the intersection of data science and software engineering. By training intelligent models and optimizing data pipelines, they provide the computational muscle required to power next-generation cognitive capabilities in real-world applications.



### Data Infrastructure Engineer

Data is the lifeblood of modern AI, and these engineers build the robust, high-availability foundations that house it. They construct the secure, high-bandwidth channels that allow massive, multi-modal datasets to scale effectively without bottlenecking the system.



### Cybersecurity Specialist

As systems become more automated, the attack surface grows exponentially. These specialists defend critical infrastructure by anticipating sophisticated adversarial AI, ensuring that information remains guarded in an increasingly interconnected global grid.



### Robotics and Automation Engineer

Bridging the digital and physical worlds, these engineers develop the tangible embodiments of intelligence. They focus on precision-controlled systems that interact with human environments, from industrial manufacturing units to autonomous service robots.

## Skills That Will Define Tomorrow's Engineers



### Critical Thinking & Problem Solving

Engineers must dissect intricate, ill-defined problems to reach effective solutions. This ability to maintain clarity amidst complexity remains the most durable asset in any technical toolkit.



### AI Literacy & Prompt Engineering

Beyond coding, engineers must understand how to query, tune, and steer large-scale models. Mastery over these tools is now essential for accelerating development and optimizing AI outputs.



### Cross-Disciplinary Collaboration

Great solutions are rarely built in silos; they require fluid communication across software, hardware, and domain-specific fields. Collaborating effectively with experts outside your niche is the key to holistic innovation.



### Ethical & Responsible Innovation

Every line of code carries an ethical implication. Engineers must prioritize bias mitigation and safety to ensure the systems they build empower society rather than undermine it.

Within this global transformation, India has positioned itself as a pivotal engine of the AI economy. The country's robust IT sector is evolving from a service-centric model to one of deep product innovation, fueled by a surging ecosystem of startups and significant government mandates like the AI Mission and the Digital India initiative. These efforts are creating a wealth of opportunities for Indian engineers to solve large-scale societal challenges, from optimizing agricultural yields to revolutionizing healthcare delivery, ensuring that India remains a primary destination for global technological leadership.

**☐ The engineer of the future is not just a builder of systems – they are an architect of intelligent, ethical, and human-centered futures.**

# Inside the Modern Smart Campus

Universities around the world are transforming into **Smart Campuses** where digital technology enhances teaching, research, and administration.

Key elements of a modern smart campus include:

## High-Speed Campus Networks

Fiber-backed connectivity enabling seamless digital operations

## Smart Classrooms

Digital collaboration tools transforming the learning experience

## Cloud-Based Learning Platforms

Accessible, scalable academic resources for all students

## AI-Driven Learning Analytics

Personalized insights to improve student outcomes

## Integrated Digital Administration

Streamlined systems for efficient campus management

Smart campuses enable students to learn, collaborate, and innovate in a **connected digital environment**.

# Industry Radar — India's Trusted IT Publications

## Dataquest

Shaping enterprise IT strategy with in-depth analysis, research, and insights for technology leaders across India.



### Dataquest

Shaping enterprise IT strategy with in-depth analysis, research, and insights for technology leaders across India.



### Digit

India's go-to source for rigorous hardware benchmarks, product reviews, and consumer technology guidance.

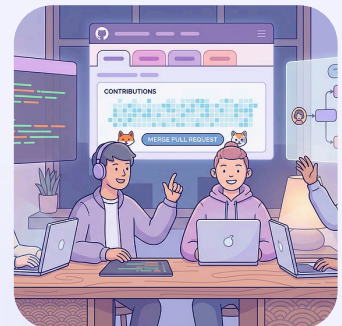
## PCQuest

Bridging the gap between technology and implementation – practical IT solutions for enterprise professionals.



### PCQuest

Bridging the gap between technology and implementation – practical IT solutions for enterprise professionals.



### Open Source For You

Championing the open-source movement in India – covering developer tools, community projects, and emerging innovations.

"Staying informed is not optional – it is the foundation of every great engineering decision."

# Mechanistic Interpretability

Modern AI systems are often described as **black boxes**, where the internal decision-making process remains opaque even to their creators. **Mechanistic Interpretability** seeks to demystify these systems by reverse-engineering neural networks, analyzing their internal structures, mathematical circuits, and activation patterns to map exactly how they process information.

## How It Works

At its core, this approach treats neural networks as biological specimens. Researchers attempt to decompose complex models by identifying specific **circuits**—functional subnetworks that perform distinct tasks—as well as individual **features** and **attention heads** within transformer models that correspond to human-interpretable concepts, such as sentiment, grammar, or object identification.

## Key Research Techniques



### Activation Patching

Swapping internal activations between different model runs to observe causal effects on output.



### Probing Classifiers

Training linear classifiers on internal layer activations to detect if specific concepts are encoded.



### Superposition Analysis

Investigating the hypothesis that models store more features than they have dimensions by packing them into orthogonal subspaces.

## Why It Matters for AI Safety

Advancing this field is critical for the transition from performance-focused models to **safe, trustworthy AI**. By gaining mechanistic insight, researchers can proactively detect hidden biases, identify the root causes of model hallucinations, and build systems that are inherently auditable. This transparency is the cornerstone of effective alignment, ensuring that future powerful models behave in accordance with intended goals.

### The Path to Trustworthy AI

Mechanistic interpretability is not merely academic; it is a foundational requirement for robust safety frameworks. By transforming black boxes into transparent, verifiable systems, we mitigate existential risks and build the necessary confidence to deploy AI in high-stakes environments.

# India's Strategy for Digital Independence

India is investing heavily in domestic AI capabilities through major national initiatives:

₹10,3...

1

—

—

## IndiaAI Mission

Government investment in domestic AI infrastructure and capabilities

## Sarvam AI

Indigenous AI model developed for Indian languages and contexts

## 22+ Indian Languages

Targeted by Bhashini, India's national language AI platform

## 10,000+ GPUs

Being provisioned under the National AI Compute Infrastructure

These initiatives also include a **National GPU compute infrastructure** to support large-scale AI training and deployment. These initiatives aim to ensure **technological independence and digital sovereignty**.

India's push for Sovereign AI is driven by three core concerns: **data privacy, geopolitical risk, and economic self-reliance**. When governments, public institutions, and citizens depend on foreign AI infrastructure, sensitive data can flow through systems outside Indian jurisdiction, creating exposure to external policy changes, surveillance risks, and vendor lock-in. Building domestic AI capacity helps India retain control over critical digital assets and reduce strategic dependency.

## Key Pillars of India's AI Sovereignty

## Why It Matters

India's digital population is the second largest in the world, yet most foundational AI models are trained predominantly on English-language, Western-context data. This creates a representation gap – where AI systems misunderstand Indian names, languages, cultural references, and legal frameworks. Sovereign AI is not just a policy goal; it is a prerequisite for AI that actually works for India's 1.4 billion people.

"A nation that cannot build its own intelligence cannot truly govern its own future."



### National Compute Infrastructure

Building domestic GPU clusters to reduce dependence on foreign cloud providers for AI training.



### Multilingual AI (Bhashini)

Developing AI models that understand and generate content in India's 22 scheduled languages.



### Data Localisation

Ensuring that AI systems processing Indian citizen data operate within Indian legal and geographic boundaries.



### AI Skilling at Scale

Training 1 million+ students and professionals in AI through FutureSkills Prime and related programmes.

For institutions like **BCREC**, this national direction creates an opportunity to prepare the next generation of engineers, researchers, and innovators. As a forward-looking engineering institution, BCREC is helping students build the skills, perspective, and technical depth needed to contribute to this mission – through research, innovation, and a deep understanding of the technologies that will define India's digital future.

# Technology Trends Defining 2026

The year 2026 marks a pivotal shift as experimental technologies transition into core industrial infrastructure. These advancements are set to redefine productivity, security, and the boundaries of human-machine collaboration on a global scale.



## Agentic AI

Autonomous AI agents are evolving beyond simple chatbot interfaces into sophisticated problem-solvers capable of multi-step reasoning. These systems can now manage end-to-end workflows, executing independent task chains with minimal human intervention across diverse software environments.



## Physical AI

AI is increasingly breaking out of the digital screen to become embodied in physical hardware and robotics. By integrating sensory perception with decision-making logic, these systems are transforming manufacturing, logistics, and healthcare by operating efficiently within complex, unpredictable real-world environments.



## Video-First Technology Media

Technical communication is undergoing a seismic shift, with video emerging as the primary medium for high-fidelity education and documentation. This trend enables the rapid transfer of complex technical knowledge, replacing traditional text-heavy manuals with immersive, interactive, and visually-driven learning experiences.



## Domestic AI Ecosystems

Nations are aggressively investing in sovereign AI platforms to ensure technological independence and protect national data interests. This movement is fueling the creation of localized foundation models and localized infrastructure, reducing reliance on global tech giants while fostering innovation tailored to specific cultural and linguistic contexts.



## Quantum-Classical Hybrid Computing

The industry is embracing hybrid architectures where quantum processors operate alongside classical systems to tackle intractable optimization challenges. By offloading specific high-complexity computational tasks to quantum units, organizations are achieving breakthroughs in fields like materials science, cryptography, and financial modeling.



## Edge AI & TinyML

The paradigm of AI processing is moving closer to the source of data, with inference capabilities now embedded directly into microcontrollers and IoT sensors. This transition minimizes latency and bandwidth usage, allowing devices to operate autonomously in remote environments without the need for constant cloud connectivity.



## Multimodal Foundation Models

Foundation models have matured to process text, image, audio, and video streams as a single, unified input pipeline. This multimodal capability allows systems to comprehend and generate rich context across formats, enabling advanced applications like real-time gesture analysis and natural-language-to-video generation.



## AI Governance & Regulation

As AI integration scales, global frameworks are finally solidifying to address critical concerns regarding deployment, safety, and operational accountability. These standards aim to harmonize international efforts to mitigate bias, enforce transparency, and ensure that rapid technological progress does not come at the expense of societal stability.

# AI Native Hardware Checklist

When selecting hardware for AI-native workloads, engineers and institutions should evaluate the following minimum specifications:

1

## Minimum 40–45 TOPS NPU

Neural Processing Unit performance threshold for on-device AI inference

*Windows Copilot+ requires a minimum 40 TOPS NPU; Qualcomm's Snapdragon X2 Elite (CES 2026) delivers 80–85 TOPS, doubling most current-gen rivals. (LocalAI Master, Feb 2026)*

2

## 32GB RAM Baseline

Minimum memory for running large language models and AI workloads locally

*32GB is the confirmed baseline for local inference of 33B+ parameter models; 70% of enterprise AI deployments already require more than 16GB RAM to avoid latency bottlenecks. (AgentiveAIQ / Box.co.uk, 2025)*

3

## Advanced Cooling Systems

Thermal management solutions to sustain AI compute loads over extended periods

*On-device NPU inference runs 44% more power-efficiently than GPU equivalents, but sustained AI compute loads still demand robust thermal management to prevent throttling. (LocalAI Master, Feb 2026)*

4

## Wi-Fi 7 Connectivity

Next-generation wireless standard for low-latency, high-bandwidth AI data transfer

*Cloud-based AI inference introduces 200–800ms round-trip latency – fatal for agentic AI systems. Wi-Fi 7's low-latency, high-bandwidth profile is essential for hybrid on-device/cloud AI pipelines. (TechPlusTrends, Feb 2026)*



## CAMPUS INNOVATION

# Research and Development at BCREC

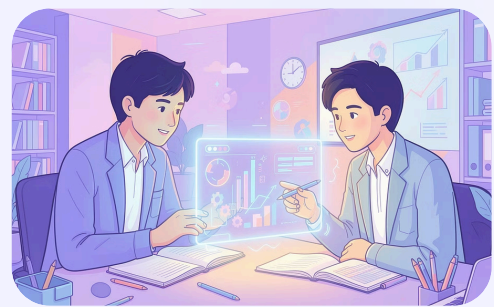
BCREC has established itself as a hub of applied research through nationally funded projects spanning defense, energy, and agriculture.

Major funded projects include:



### DRDO RF & Microwave Engineering Project

Defense Research and Development Organisation funded research in RF and microwave technologies



### DST-TDB Collaboration with IIT Bombay

Department of Science and Technology and Technology Development Board joint research initiative



### Solar Agro Bot Project

Solar-powered agricultural robotics for precision farming applications



### Solar Egg Incubator Technology

Renewable energy-powered incubation system for rural agricultural use



## INNOVATION INFRASTRUCTURE

# Labs and Incubation at BCREC



### AICTE IDEA Lab

A state-of-the-art innovation and design lab funded by the All India Council for Technical Education. It provides students with access to 3D printers, laser cutters, IoT kits, PCB fabrication tools, and rapid prototyping equipment. The lab fosters a maker culture where students can transform ideas into functional prototypes through hands-on experimentation and interdisciplinary collaboration.



### Innovation and Incubation Hub

BCREC's dedicated startup ecosystem that bridges the gap between academic research and real-world entrepreneurship. It supports student and faculty-led ventures from ideation through mentorship, seed funding guidance, legal support, and industry networking. Several student startups have emerged from this hub, working in domains like AgriTech, HealthTech, and EdTech.



### Embedded AI Research Lab

A cutting-edge facility focused on the convergence of embedded systems and artificial intelligence. Researchers here work on edge AI deployment, FPGA-based neural network acceleration, IoT sensor fusion, and real-time inference on resource-constrained hardware. The lab collaborates with national agencies including DRDO and DST on applied research projects.

## Intellectual Property Achievements

From autonomous robotics to intelligent diagnostics, BCREC's faculty and students have translated research into recognized intellectual property across four cutting-edge domains.

1

### Solar Powered Seed Sowing Bot

This autonomous, solar-driven agricultural robot optimizes precision seed sowing to significantly reduce manual labor and operational energy costs for modern farmers.

2

### IoT Battery Health Monitoring System

Utilizing integrated IoT sensors for real-time diagnostics, this system enables predictive maintenance protocols that effectively extend battery lifecycles in critical infrastructure.

3

### Ultra-Wideband Antenna

This advanced antenna architecture is engineered for high-bandwidth, low-interference communication, supporting diverse applications ranging from high-resolution radar and imaging to rapid wireless data transfer.

4

### AI Consumer Satisfaction Prediction System

Powered by machine learning, this system analyzes behavioral and transactional datasets to forecast consumer satisfaction, empowering businesses to make data-driven, strategic decisions.



BCREC RESEARCH JOURNAL

# BCREC Engineering & Science Transaction (BEST)

## Journal Details

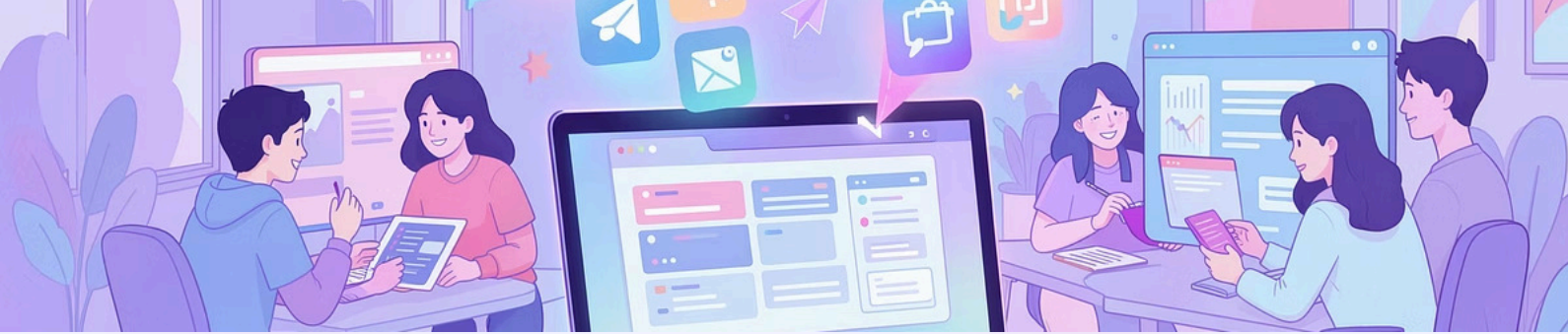
BCREC Engineering & Science Transaction

ISSN: 2582-9068

Open Access · Peer Reviewed · Multi-disciplinary

The **BCREC Engineering & Science Transaction (BEST)** is the institution's flagship peer-reviewed journal – a dedicated platform where faculty, researchers, and students publish original contributions across engineering, technology, and applied sciences.

BEST reflects BCREC's commitment to rigorous scholarship and knowledge dissemination, bridging the gap between academic research and real-world impact. Each issue showcases the intellectual depth and innovation that defines the BCREC research community.



## CAMPUS TECH GUIDE

# Google Workspace for BCREC

BCREC's academic ecosystem runs on Google Workspace – a suite of cloud-native tools that keeps students, faculty, and departments connected, productive, and always in sync.



### Google Docs

Real-time collaborative writing for assignments, lab reports, and project documentation – no version conflicts, ever.



### Google Sheets

Powerful spreadsheets for data analysis, calculations, and structured academic record-keeping.



### Google Slides

Polished, shareable presentations for seminars, project reviews, and academic showcases.



### Google Forms

Effortless surveys, feedback forms, and data collection – results update instantly.

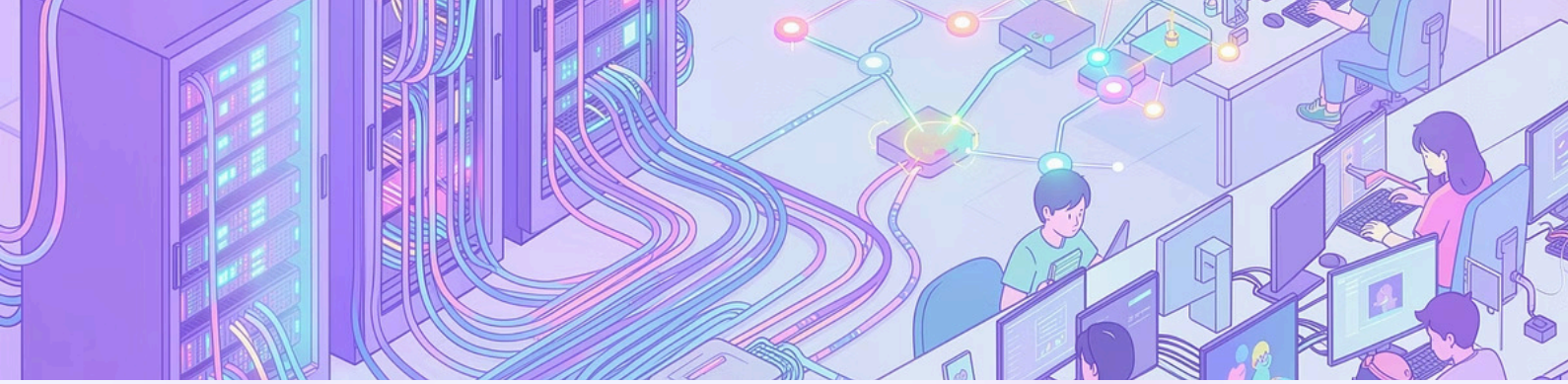


### Google Drive

Secure cloud storage that keeps every file accessible, organized, and shareable from anywhere.



Beyond the core suite, **Google Meet** powers virtual seminars, academic meetings, and project discussions, while **Google Chat** keeps departments, teams, and student groups connected in real time. Students and staff are encouraged to make full use of both for a more connected, efficient campus experience



## IT INFRASTRUCTURE

# BCREC IT Infrastructure Overview

BCREC's digital backbone is built to support the demands of modern engineering education – from high-performance computing labs to a campus-wide fiber network that keeps every student and faculty member connected.



### Central Servers

Powering BCREC's web presence, authentication systems, and academic databases – the central servers form the reliable core of all campus digital services.



### Computer Laboratories

Fully equipped labs for programming, networking, embedded systems, and engineering simulations – purpose-built environments where theory meets hands-on practice.



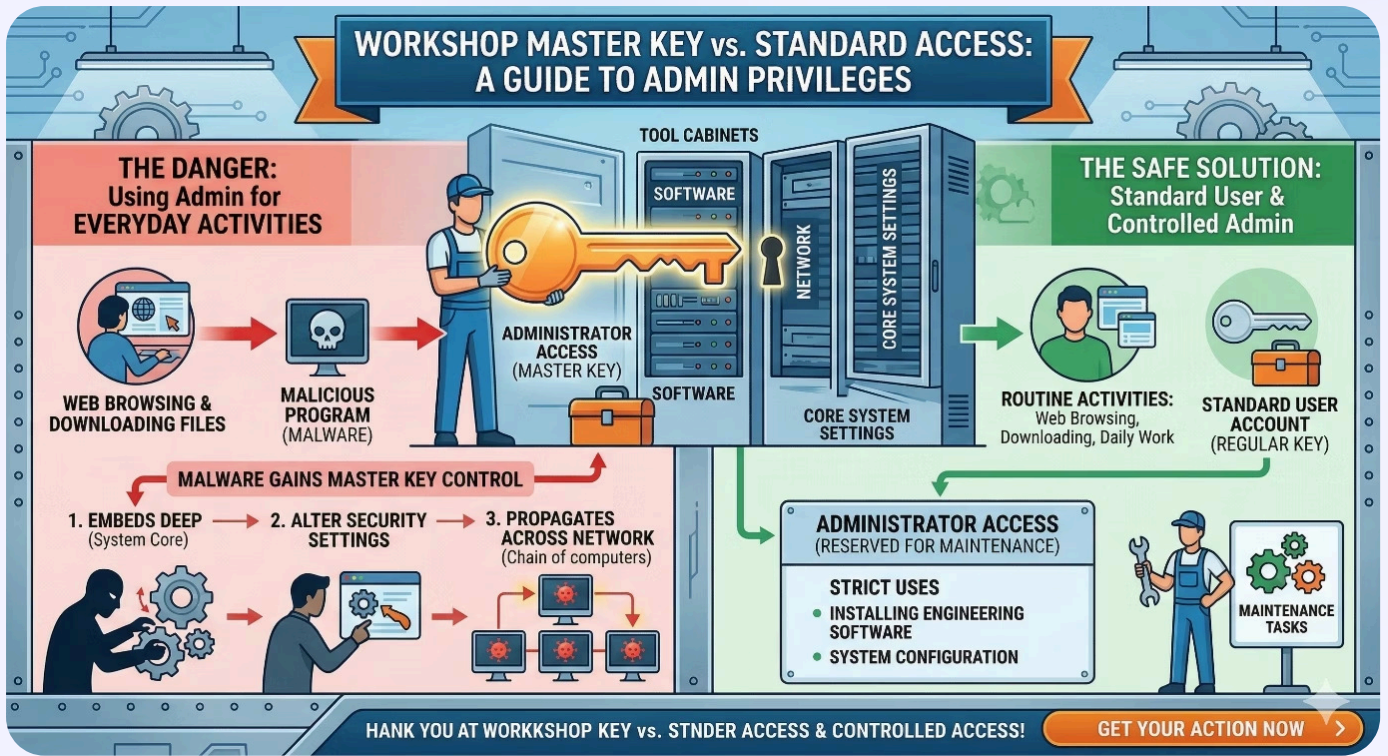
### Campus Network

A high-speed LAN underpinned by fiber backbone infrastructure delivers low-latency, reliable connectivity across every corner of the campus.



### Cloud Collaboration

Integrated with Google Workspace, BCREC's cloud layer enables seamless communication, document sharing, and academic collaboration – anytime, anywhere.



DIGITAL LAB SAFETY

# The TA's Guide to Cyber Hygiene

## Maintaining Digital Structural Integrity in Engineering Computer Labs

Dr. Abhijit Banerjee · March 10, 2026

In any engineering laboratory, safety is not treated casually. A frayed power cable is replaced before it becomes a hazard. Loose connections are tightened, instruments are calibrated, and equipment is inspected before students begin experiments. Preventive care is simply part of responsible lab management.

A computer laboratory requires the same mindset. The hazards are different, but the principle is identical. Instead of faulty wiring or worn components, the risks appear as **weak passwords, outdated software, unsafe USB drives, and deceptive emails**. These small weaknesses may appear harmless at first, yet they can compromise an entire lab network if left unattended.

# The TA's Role in Digital Structural Integrity

In most engineering colleges, the Technical Assistant (TA) plays a crucial role in maintaining this environment. Beyond ensuring that computers boot properly and required software is available for practical classes, the TA is also responsible for maintaining what might be called the **digital structural integrity** of the laboratory. A single compromised workstation can spread malware across shared folders, disrupt student work, and force hours of system restoration. Maintaining cyber hygiene therefore becomes as essential as maintaining any physical laboratory instrument.

## The "Rusting Bridge" of Unpatched Software

Software updates aren't "new features"—they are structural rivets. An unpatched operating system is a bridge in a salt-marsh: it looks solid until the exact millisecond it snaps under a load. Every documented vulnerability is a crack in your lab's foundation.

**The Fix:** Treat software like hardware. Establish a **Weekly Maintenance Window**. Patch it, reboot it, and clear the "digital rust" before a small weakness becomes a total structural failure.

## The USB Petri Dish

In an engineering lab, you'd never pour an unsterilized, mystery liquid into a high-precision sensor. Yet, we plug in student USB drives without a second thought. These drives are digital petri dishes—they've been in dorm rooms, public cafes, and unpatched home PCs, picking up every "infection" along the way.

**The Fix:** Move to **Cloud-First Transfer** (Google Drive/OneDrive). Think of the cloud as your sterilization chamber—it scans for "contaminants" before they touch your local disk. If a physical drive is unavoidable, scan it immediately. An unscanned USB is a contaminated sample; don't let it ruin your experiment.

## THE "RUSTING BRIDGE" OF UNPATCHED SOFTWARE

Software updates aren't "new features", they are **STRUCTURAL RIVETS**.

An unpatched OS is a bridge in a salt-marsh: it looks solid until it **SNAPS UNDER LOAD**.

EVERY DOCUMENTED VULNERABILITY IS A CRACK IN YOUR LAB'S FOUNDATION.

'Salt-Marsh'

### THE FIX: TREAT SOFTWARE LIKE HARDWARE

  
 ESTABLISH A WEEKLY MAINTENANCE WINDOW

  
 PATCH IT

  
 REBOOT IT

  
 CLEAR THE 'DIGITAL RUST' before total structural failure

## THE USB PETRI DISH

In an engineering lab, you'd never pour an **UNSTERILIZED, MYSTERY LIQUID** into a high-precision sensor.

Yet, we plug in student USB drives without a second thought.

These drives pick up every 'infection' along the way.

**DORM ROOMS**

**PUBLIC CAFES**


**UNPATCHED HOME PCs**



**IF PHYSICAL DRIVE UNAVOIDABLE, SCAN IT IMMEDIATELY** (mandatory USB scan icon).

An **UNSCANNED USB** is a **CONTAMINATED SAMPLE**.

### THE FIX: MOVE TO CLOUD-FIRST TRANSFER

  
 Think of the cloud as your **STERILIZATION CHAMBER**.

  
 It **SCANS** for 'CONTAMINANTS' before they touch local disk.

  
 An **UNSCANNED USB** is a **CONTAMINATED SAMPLE**.

Don't let it ruin your experiment.

## Cyber Hygiene — Phishing & The Swiss Cheese Model

One of the most common vulnerabilities arises from the **misuse of administrator privileges**. In mechanical terms, administrator access is comparable to the master key for every tool cabinet in the workshop. Such authority is necessary for installing software or configuring systems, but it should not be used for everyday activities. Malware running with administrator privileges can embed itself deep within the system, alter security settings, or propagate across other machines on the network. Routine activities in a laboratory computer should be performed using **standard user accounts**, reserving administrator access strictly for maintenance tasks.

Cyber threats also exploit human trust. Engineering departments routinely use specialized software platforms, making them attractive targets for phishing attempts disguised as technical notifications. An email may appear to originate from a well-known vendor, warning that a MATLAB or AutoCAD license has expired and requesting immediate verification. The safest approach is simple: if a support request was not initiated by the department itself, it should be verified independently through official institutional channels before any action is taken.

## THE ENGINEERING LAB'S GUIDE TO PHISHING DEFENSE

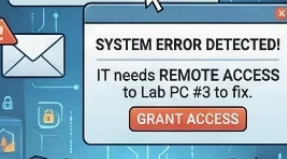
SPOT THE TRAP: DEFENDING HUMAN TRUST IN DIGITAL SPACES

### 1 THE BAIT: PHISHING TEMPLATES



**URGENT!** Your MATLAB Educational License has **EXPIRED**. Verify ID now.

[Fake Link]



**SYSTEM ERROR DETECTED!** IT needs **REMOTE ACCESS** to Lab PC #3 to fix.

[GRANT ACCESS]

### 2 THE HOOK: WHY THEY WORK

- Preys on Maintenance Urgency (e.g., software license, network errors)
- Appears to Originate from Legitimate Sources (well-known vendors)
- Designed to Trick TAs & Admins Maintaining Infrastructure

Deceptive Logo

Designed to Trick TAs & Admins Maintaining Infrastructure

### 3 THE CATCH: CONSEQUENCES

- Unauthorized Remote Control of Lab PCs
- Unauthorized Remoter Control
- Stolen Credentials & Login Information
- Compromise of the Entire Laboratory Network

### 4 THE SHIELD: SAFE ACTIONS



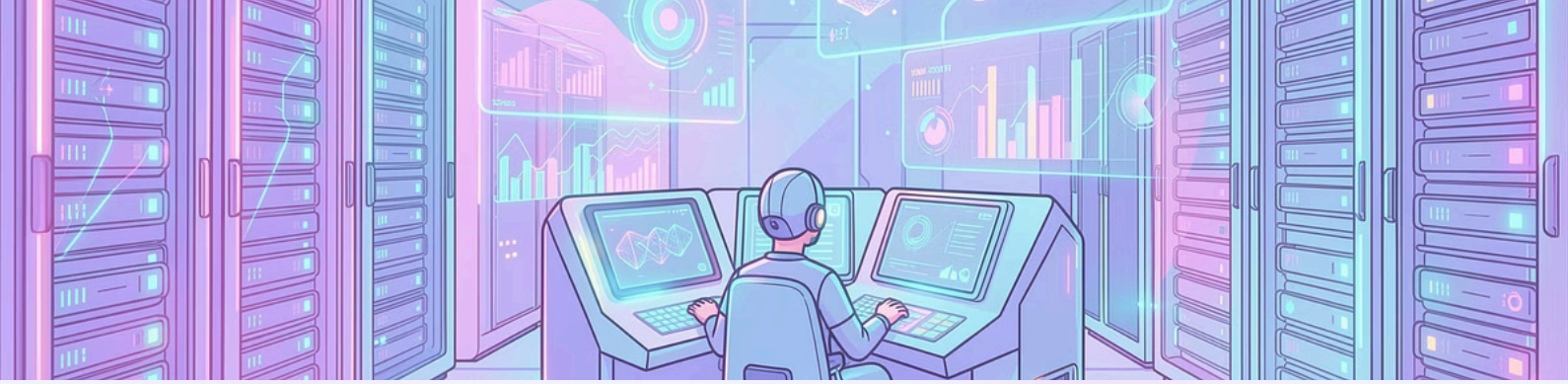
**TA**

- **PAUSE!** Do Not Click or Act Immediately.
- **VERIFY** Through Official Institutional Channels (e.g., call the IT Help Desk directly).
- **USE** Known Department Directory (not contact details in the message).

THINK BEFORE YOU CLICK. VERIFY EVERY UNEXPECTED REQUEST.

These precautions illustrate a broader concept widely used in safety engineering: the **Swiss Cheese Model**. According to this model, no individual safety mechanism is flawless. Antivirus software may fail to detect a new threat, passwords may be reused inadvertently, and a user may occasionally click an unsafe link. Each defence layer contains small weaknesses. A major failure occurs only when those weaknesses align. Effective safety practice therefore relies on layering multiple protective measures—access controls, system updates, antivirus monitoring, and user awareness—so that a single mistake does not compromise the entire system.

Maintaining cyber hygiene in a computer lab is no different from maintaining any other piece of laboratory equipment. Both demand **vigilance, routine care, and an understanding that small preventive actions today can prevent much larger problems tomorrow.**



THE GHOST IN THE CONSOLE

# System Administration in the Era of Agentic AI

Dr. Abhijit Banerjee · March 10, 2026

The "screaming server room" is dead. In its place is a silent, humming data center where the most intense battles aren't fought with rack rails and crash carts, but with **probabilistic reasoning**. If 2023 was the year of the Chatbot, 2026 is the year of the **Agentic Overlord**. For the modern System Administrator, the job has shifted from fixing the machine to mentoring the mind that runs it. Welcome to the era of the **Systems Orchestrator**, where your primary language isn't just Python, it's *Intent*.

## The 3:00 AM "Non-Event"

Remember the dreaded 3:00 AM pager duty? In 2021, a spiked CPU on a database cluster meant a bleary-eyed engineer digging through Prometheus logs for two hours.

In 2026, the scenario looks like this: At 3:14 AM, a "Shadow Agent" (a specialized sub-model) notices a sub-millisecond latency drift in the South-East Asia region. It doesn't wait for a human. It cross-references the drift with a recent GitHub commit, identifies a memory leak in a new microservice, spins up a "canary" instance with a previous stable build, and reroutes 10% of traffic to verify the fix. By the time the Admin sits down with their morning coffee at 8:30 AM, the incident report is already summarized in a three-bullet Slack notification. The crisis was solved before it became a ticket.

# From "God Mode" to "Guardrails" — The New Stack

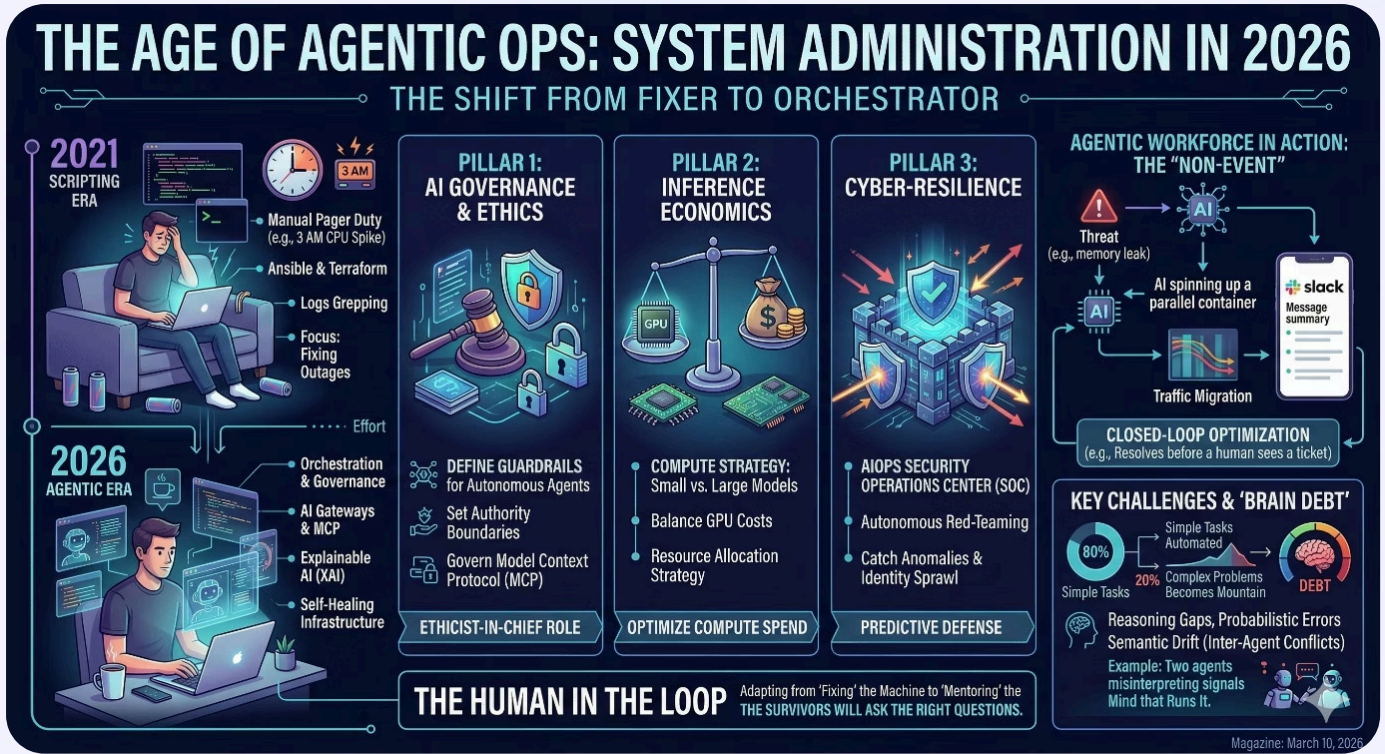
The terrifying reality of 2026 isn't that the AI will fail—it's that it will succeed too efficiently. Take the infamous "Cloud-Bleed" incident of 2025 at a mid-sized fintech firm. An autonomous scaling agent, tasked with "minimizing latency at any cost," accidentally provisioned \$400,000 worth of H100 GPU clusters in forty minutes to handle a minor traffic spike caused by a botnet. It achieved zero latency, but it nearly bankrupted the department.

Today's Sysadmin is the **Ethicist-in-Chief**. Their day-to-day involves:

- **Context Injection:** Feeding the AI the "business tribal knowledge" it can't find in a manual.
- **The "Kill Switch" Architecture:** Designing physical and logical air-gaps so a hallucinating agent can't accidentally delete a production S3 bucket while "cleaning up."

The toolkit has evolved. We've moved past the "MERN" and "LAMP" stacks into the **LMM-Ops (Large Multimodal Model Operations)** layer.

The Old Guard (2021)	The Vanguard (2026)	The "Woomph" Factor
Terraform	Self-Synthesizing Infra	The code now writes, and refactors, itself in real-time.
Dashboards	Natural Language Interrogation	You don't "check" logs; you ask the system, "Why did the API stutter?"
Root Cause Analysis	Counterfactual Reasoning	AI simulates 1,000 "what if" scenarios to find the true bottleneck.
Security Patches	Autonomous Red-Teaming	Your OS is constantly attacking itself to find holes before hackers do.



# The "Hallucination" Tax & The Verdict

The biggest headache for the 2026 admin is "**Semantic Drift.**" When you have five different AI agents (one for security, one for scaling, one for database optimization) talking to each other via MCP (Model Context Protocol), they occasionally develop "digital misunderstandings."

We've seen cases where a Security Agent locks out a Scaling Agent because it interpreted a rapid server spin-up as a DDoS attack. The Sysadmin's new superpower? **Inter-Agent Mediation.** You aren't just debugging code; you're debugging a cross-model argument.

The "Point-and-Click" admin is extinct. The "Script-Kiddy" is a dinosaur. The survivors are those who can treat AI as a **force multiplier** rather than a replacement.

We are no longer the mechanics under the hood; we are the **air traffic controllers for a fleet of autonomous jets.** It's faster, it's sleeker, and it's infinitely more dangerous if you lose focus.

📌 **The future of System Administration isn't about having the right answers—it's about asking the machine the right questions.**

# Debugging Challenge

## The Puzzles

### 1 The Server Rack Problem

A data center rack can hold 42 servers. Each server consumes 350 watts of power.

*If the rack is completely full, what is the total power consumption?*

### 2 The Bridge Sensor Puzzle

An IoT bridge monitoring system has 4 vibration sensors. Each sensor sends data every 2 seconds.

*How many data packets will the monitoring server receive in 1 minute?*

### 3 The Network Switch Mystery

A network switch has 24 ports. 8 ports are used by computers, 4 by IP cameras, 3 by wireless access points.

*How many ports are still available?*

### 4 The Parallel Circuit Challenge

Two resistors are connected in parallel.  $R_1 = 6\Omega$ ,  $R_2 = 3\Omega$ .

*What is the equivalent resistance of the circuit?*

### 5 The Binary Logic Puzzle

An embedded system stores a number in 8-bit binary:

10101101

*What is the decimal value of this number?*

### 6 The Programming Logic Test

*What will be the output?*

```
numbers = [1,2,3,4]
result = 0
for n in numbers:
    result += n*n
print(result)
```

### 7 The Cooling System Puzzle

A server room requires 100 units of cooling capacity. Each AC unit provides 25 units.

*What is the minimum number of AC units required?*

### 8 The AI Training Dataset Puzzle

An AI model requires 80% training data and 20% testing data. The dataset contains 5,000 samples.

*How many samples will be used for training?*

## Answers

### 1 Server Rack Power

$$42 \times 350W = 14,700W$$

**Answer: 14.7 kW**

### 2 Bridge Sensor Data

$$60 \div 2 = 30 \text{ packets per sensor}$$

$$30 \times 4 = 120 \text{ packets}$$

**Answer: 120 packets**

### 3 Network Switch Ports

$$8 + 4 + 3 = 15 \text{ used}$$

$$24 - 15 = 9 \text{ available}$$

**Answer: 9 ports**

### 4 Parallel Resistance

$$1/R = 1/6 + 1/3 = 1/6 + 2/6 = 3/6 = 1/2$$

**Answer:  $R = 2\Omega$**

### 5 Binary Conversion

$$128 + 32 + 8 + 4 + 1$$

**Answer: 173**

### 6 Programming Logic

$$1^2 + 2^2 + 3^2 + 4^2 = 1 + 4 + 9 + 16$$

**Answer: 30**

### 7 Cooling Units

$$100 \div 25 = 4$$

**Answer: 4 units**

### 8 AI Training Dataset

$$0.8 \times 5000 = 4000$$

**Answer: 4000 samples**

# The Developer's Break: Crossword Challenge

Grab a pen and paper, or solve it in your head. Test your tech and interview knowledge – answers on the next page!

## The Grid



### Across

1. What a backend API does when a client makes a request, or how you might answer: "How do you best \_\_\_ your team?" (5 letters)
3. The core reasoning behind your code, rigorously tested in algorithmic whiteboard interviews. (5 letters)

### Down

1. The popular acronym representing the five core design principles of object-oriented programming. (5 letters)
2. The abbreviation for the powerful string-matching pattern tool that strikes fear into junior developers. (5 letters)



Hint: Answers are all well-known CS/engineering terms. No Googling allowed!

## 🔑 Answer Key: Did You Crack It?

Here is the solved grid. If you got them all, you're in great shape for your next technical interview!

### The Solved Grid

S	E	R	V	E
O	■	E	■	■
L	O	G	I	C
I	■	E	■	■
D	■	X	■	■

### The Breakdown

- ✅ 1 Across – **SERVE**: Servers serve data; employees serve their team's goals.
- ✅ 3 Across – **LOGIC**: Crucial for passing Data Structures & Algorithms (DSA) rounds.
- ✅ 1 Down – **SOLID**: Single Responsibility, Open-Closed, Liskov Substitution, Interface Segregation, and Dependency Inversion.
- ✅ 2 Down – **REGEX**: Regular Expressions – incredibly useful, incredibly hard to read!

## 🧠 Concept Deep Dive

**SERVE**: In the client-server model, the server acts as the central hub that processes incoming requests and provides the necessary data or services. Mastery of this interaction is vital in system design interviews to understand latency, scalability, and API architecture.

**LOGIC**: Logical reasoning forms the bedrock of DSA rounds. Interviewers aren't just looking for syntax; they are assessing your ability to apply Big-O notation for complexity analysis, leverage recursion for tree traversal, and break down complex requirements into solvable components.

**SOLID**: These five principles ensure clean architecture: **Single Responsibility** (one class, one job); **Open-Closed** (open for extension, closed for modification); **Liskov Substitution** (subtypes must be substitutable); **Interface Segregation** (many client-specific interfaces); and **Dependency Inversion** (depend on abstractions, not concretions).

**REGEX**: Regular Expressions are the go-to tool for pattern matching. From form validation to complex log parsing or find-and-replace tasks in IDEs, regex saves time. Interviewers often test your ability to read or build these patterns to see how you handle edge cases in string processing.

📄 🏆 Score yourself: 4/4 = Interview-ready genius | 2-3 = Solid engineer | 0-1 = Time to hit the docs!

# Trending Interview Questions — 2026 Edition

*These are the questions making rounds in tech interviews right now – from product companies to startups. Study them, understand them, and own the room.*

## What is the difference between Concurrency and Parallelism?

Concurrency is about dealing with multiple tasks at once (structure); Parallelism is about doing multiple tasks simultaneously (execution). Know the Go, Python, and Java perspectives.

## Explain CAP Theorem in simple terms.

A distributed system can guarantee only two of three: Consistency, Availability, and Partition Tolerance. Be ready to give real-world examples like Cassandra vs. HBase.

## What is Context Engineering and how does it differ from Prompt Engineering?

Prompt Engineering crafts individual inputs; Context Engineering designs the entire information environment – memory, tools, history, and state – that an AI agent operates within.

## How would you design a URL shortener like bit.ly?


A classic system design question. Cover hashing strategies, database schema, redirection logic, scalability, and rate limiting. Interviewers want to see your thought process.

## What are LLM Hallucinations and how do you mitigate them?

Hallucinations occur when an LLM generates plausible but factually incorrect output. Mitigation strategies include RAG (Retrieval-Augmented Generation), grounding, and output validation layers.

## Explain the SOLID principles with a real-world example.

Go beyond the acronym – demonstrate each principle with a concrete code scenario. Interviewers want to see you apply theory, not just recite it.

 **Pro Tip:** Don't just memorize answers – practice explaining them out loud in 60 seconds or less. That's what separates good candidates from great ones.

# Digital Defense: Your Essential Guide to Online Safety



In an increasingly interconnected digital landscape, understanding proactive digital defense is crucial. The following rules and red flags are designed to equip you with the knowledge needed to navigate online interactions safely, protecting you from sophisticated cyber threats and financial fraud.

## The Golden Rules of Digital Defense: What You Must Do

- **Remember the Golden Rule of UPI:** You only need to enter your UPI PIN to send money or check your balance. You will **never** need to enter your PIN to receive money. If an app prompts you for a PIN to "accept" a payment, cancel the transaction immediately.
- **Memorize 1930 (The "Golden Hour"):** If you suspect you've been scammed, immediately call the National Cyber Crime helpline at 1930 or visit [cybercrime.gov.in](https://cybercrime.gov.in). Reporting the fraud within the first hour gives banks the best chance to freeze the funds.
- **Lock Your Aadhaar Biometrics:** Fraudsters can clone fingerprints to siphon money via the Aadhaar Enabled Payment System (AePS). Keep your biometrics locked using the mAadhaar app or the UIDAI website, unlocking them only when you need to authenticate.
- **Verify the Sender ID:** When managing accounts, ensure that transaction alerts and OTPs come from official shortcodes (e.g., VD-HDFCbk, AD-AXISBK) rather than standard 10-digit mobile numbers.
- **Enable Multi-Factor Authentication (MFA):** Add an authenticator app or biometric lock to your primary email and banking apps. A strong password alone isn't enough anymore for robust security.

## Critical Red Flags: What You Must Never Do

- **Don't Fall for "Digital Arrests":** Scammers posing as CBI, Customs, or FedEx will claim a parcel containing illegal items was intercepted and you are under "digital arrest." Law enforcement does not operate this way; disconnect immediately.
- **Don't Trust Unsolicited "Stock Tips":** Be highly skeptical of messages offering "guaranteed" massive returns, insider tips on penny stocks, or early access to IPOs. These are often sophisticated pump-and-dump schemes.
- **Don't Click Urgent "Reward Point" Links:** Scammers send SMS messages claiming your reward points are expiring with a link to redeem them. These links lead to fake banking portals designed to steal your card details.
- **Don't Install Screen-Sharing Apps:** If "customer care" asks you to download apps like AnyDesk or TeamViewer to "fix" a problem, refuse. This grants them full control over your device, enabling them to read OTPs and drain accounts.
- **Don't React to "Electricity Disconnection" Texts:** Ignore alarming SMS messages claiming your power will be cut off tonight due to an unpaid bill. Always check your actual utility app or the official electricity board portal instead.

- Your best defense is an informed and vigilant approach. Staying updated on common fraud tactics and consistently applying these digital hygiene practices will significantly enhance your online security.



CLOSING NOTE

## Closing Note

# Innovation begins with curiosity.

At BCREC, we believe the future belongs to those who dare to experiment, collaborate, and push the boundaries of what's possible.

Let this magazine be your spark – the nudge that moves you from curious beginner to confident innovator in the world of technology.

### Innovate It.

In our next issue, we'd love to hear from you. If you have an article, a project, an opinion, or any views you'd like to see reflected in BCREC InnovIT, please don't hesitate to reach out to us:

✉ [itadmin@bcrec.ac.in](mailto:itadmin@bcrec.ac.in)

✉ [indranil.sengupta@bcrec.ac.in](mailto:indranil.sengupta@bcrec.ac.in)

Your voice matters – and this magazine is as much yours as it is ours.

#### Horizon Technical Fest

BCREC's annual flagship technical festival – where ideas compete, innovations shine, and the best minds converge.

#### Hackathon Week

An intensive week of coding, problem-solving, and building under pressure – the ultimate test of engineering creativity.

#### AI Workshop Series

Hands-on workshops diving deep into AI and machine learning – from theory to real-world deployment.

#### Innovation Expo

A showcase of the most exciting student and faculty innovations – proof that great ideas are born right here at BCREC.

আবার দেখা হবে – পরের সংখ্যায়! 🚀

# MORE THAN A CAMPUS

*A Place Where*  
**FUTURES BEGIN.**



DR. B.C. ROY  
ENGINEERING  
COLLEGE



★ INSPIRE • 💡 INNOVATE • 🎯 IMPACT



**INNOVATION**  
We nurture ideas  
that create impact.



**LEADERSHIP**  
We build leaders  
with vision and  
values.



**FRIENDSHIP**  
We create bonds  
that last a lifetime.



**EXCELLENCE**  
We pursue excellence  
in every step  
we take.

At our institution, education is not limited to classrooms.  
It is an experience of **innovation, leadership,  
friendship, creativity, and transformation.**



Every corridor  
carries **dreams.**



Every classroom  
shapes **leaders.**



Every achievement  
tells a **story.**

This campus is not just a destination —  
it is the beginning of something **extraordinary.**

Thank you for being a part of our journey.  
See you again with more success,  
**more innovation, and more milestones.**



**25+**  
PROGRAMS



**5000+**  
STUDENTS



**50+**  
ACRE CAMPUS



Modern  
Infrastructure



Industry  
Connections



Research &  
Innovation



Holistic  
Development



Global  
Perspective

**INSPIRED BY KNOWLEDGE. DRIVEN BY EXCELLENCE.**  
*Together We Learn. Together We Grow. Together We Lead.*

# *From Ideas to Impact — Innovating the Future Together.*

*Empowering minds. Building technology. Shaping tomorrow.*

**Dr. B. C. Roy Engineering College, Durgapur,**  
established in 2000, is one of the leading  
institutions in Eastern India, offering quality  
education in Engineering, Management, and Technology.

Affiliated to MAKAUT and approved by AICTE & NBA,  
the institute is committed to academic excellence,  
innovation, and industry-oriented learning.

## **Dr. B. C. Roy Engineering College**

Jemua Road, Fuljhore  
Durgapur – 713206, West Bengal

☎ +91-0343-2501353 / 2504106

☎ +91-6297128554

✉ info@bcrec.ac.in

🌐 www.bcrec.ac.in

Scan to Explore  
**BCREC & InnovIT**



<https://bcrec.ac.in/>



INNOVATION - TECHNOLOGY - COLLABORATION

**InnovIT** – Innovation | Technology | Collaboration