Vision of the Institute
To be a nationally recognized institution of excellence in technical education and produce competent professionals capable of making a valuable contribution to society.

Mission of the Institute
- To promote academic growth by offering state-of-the-art undergraduate and postgraduate programs.
- To undertake collaborative projects which offer opportunities for interaction with academia and industry.
- To develop intellectually capable human potential who are creative, ethical and gifted leaders.

Vision of the Department
To produce globally competent electronics & communication engineering students with knowledge of core as well as inter-discipline domains.

Mission of the Department
- Educating the students in field of electronics and communication engineering to create competent professionals with moral values, social ethics and pursuing higher education.
- Inculcating the understanding technical competence in the fields of electronics and communication engineering and implementation of theoretical concepts in practical multidiscipline scenarios.

Message from the Head of Department
This edition ventures into Quantum Technology, a domain poised to shape the future of electronics. We investigate the merger of quantum and classical worlds, the profound challenges and opportunities this convergence creates, and the emerging trends that will define the next technological frontier.

Quantum Technology News Highlights

QUANTUM ELECTRONICS: BASIC CONCEPTS AND QUANTUM COMPUTING

- Microsoft and Quantinuum announced a major breakthrough in quantum error correction, a critical step toward building fault-tolerant quantum computers for large-scale applications.

- A research team from Caltech demonstrated a quantum network node capable of entangling two qubits over a fiber optic cable, showing progress toward a global quantum internet.

- IBM unveiled its new quantum processor, boasting a significant increase in the number of qubits and a longer coherence time, which is essential for stable quantum operations.

- Startups in Asia are making strides in developing compact, room-temperature quantum sensors for use in various industries, from medicine to geology, marking a move from lab-based systems to practical applications.

Quantum Technology: Shaping the Future of Electronics

Quantum Computing (QC) is poised to transform electronics and communication by moving beyond the binary logic of classical computing. Unlike traditional bits, qubits can exist in superposition, enabling calculations far beyond today's supercomputers. In electronics, QC accelerates the discovery of new semiconductor materials and supports next-generation transistors, sensors, and energy storage devices. It also aids chip design by simulating complex interactions for efficiency and power optimization. In communication, QC promises unbreakable encryption through Quantum Key Distribution (QKD) and highly sensitive quantum sensors for navigation and healthcare imaging. By merging with existing electronics and IoT, QC will reshape hardware, software, and secure connectivity, driving a new era of intelligent, energy-efficient, and secure technologies.
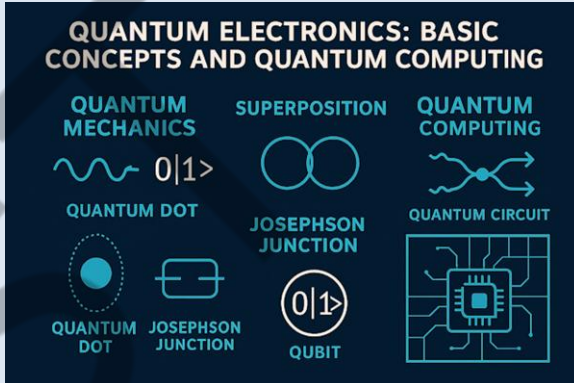
Quantum-Enhanced Electronics: Merging the Quantum and Classical Worlds

Quantum computing is moving from theory to practice, reshaping electronics and communication. Quantum-inspired computing, which simulates quantum phenomena on classical hardware, is already optimizing algorithms in logistics, finance, and materials science, serving as a bridge to the full-scale quantum era. In applied electronics, quantum technologies are enabling ultra-precise sensors capable of detecting minute changes in temperature, magnetic fields, and gravity. These sensors are revolutionizing medical imaging, non-GPS navigation, and industrial monitoring. In communication, Quantum Key Distribution (QKD) provides unhackable encryption by exploiting quantum mechanics—any interception alters the quantum state, ensuring instant detection. Governments and financial institutions are already adopting this technology for secure networks. The synergy between quantum and classical electronics is also advancing neuromorphic computing, where chips inspired by quantum principles mimic the human brain to deliver energy-efficient AI and machine learning solutions. Together, these innovations show that quantum technology is not a distant field but a driving force redefining the future of electronics and communication.

# Challenges and Opportunities in Quantum Technology

The development of quantum technology presents both profound opportunities and significant challenges. On the opportunity side, quantum computing offers solutions to problems that are currently intractable, such as developing new drugs, creating more efficient solar cells, and designing complex logistics networks. The electronics industry can leverage this to create more powerful and energy-efficient chips. In communication, quantum technology promises unparalleled security and higher data transfer speeds, addressing the growing demands of data-intensive networks and the Internet of Things (IoT).

However, major hurdles must be overcome before widespread adoption can be achieved. Hardware limitations are a primary challenge. Qubits are highly fragile and susceptible to decoherence, where their quantum state is disrupted by environmental noise. This requires maintaining extremely low temperatures and isolating the systems, making the hardware large, expensive, and difficult to scale. Another significant challenge is error correction. While progress has been made, building a fault-tolerant quantum computer that can reliably perform long calculations remains a major engineering challenge.

Furthermore, a shortage of skilled talent in quantum physics, engineering, and computer science is a key barrier to innovation. The specialized knowledge required to operate and program quantum systems is a niche skill set. Despite these challenges, the momentum in the field is undeniable. Governments, corporations, and startups are investing heavily in research and development. The US, China, and Europe are in a global race for quantum supremacy, pouring billions into research. Collaborations between academia and industry are accelerating progress. The development of hybrid quantum-classical systems offers a near-term path to leveraging quantum power, allowing researchers to tackle complex problems using existing supercomputers with quantum accelerators. As the technology matures, miniaturization and increased stability will make quantum systems more accessible, opening the door for new applications in every sector of the economy.

> *"A quantum computer is not just a faster computer—it is a universal computing device. It can simulate the laws of physics themselves and solve problems that classical machines cannot. The implications for science, communication, and electronics are truly transformative."*
>
> *~ David Deutsch*
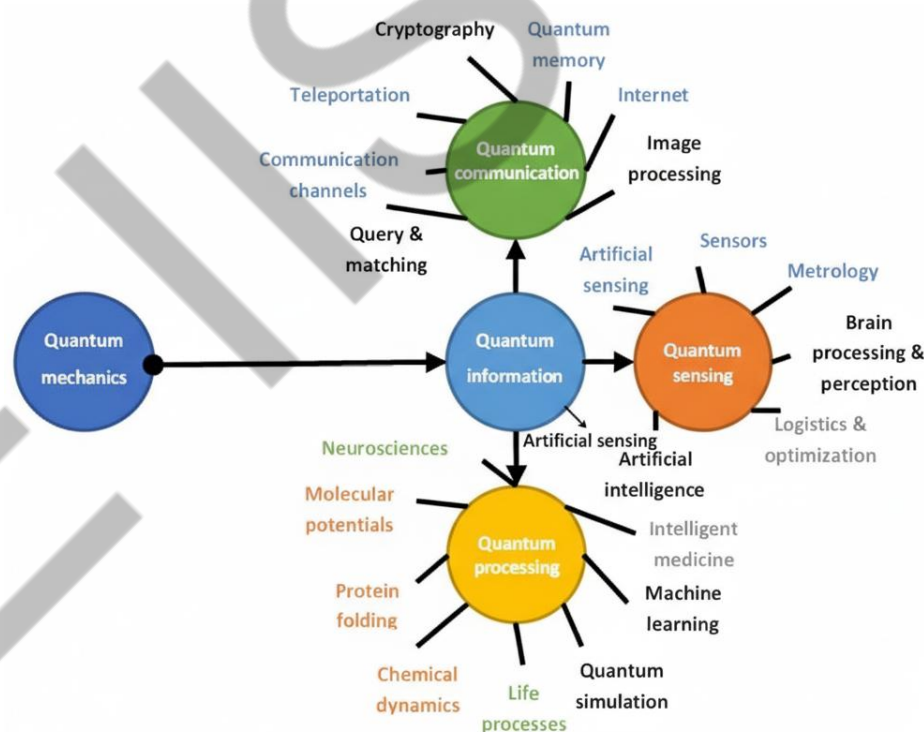
Emerging Trends in Quantum Technology

Quantum technology is evolving rapidly, driven by several key trends that are shaping its future. One of the most significant is the move toward quantum-classical hybrid computing. This model integrates quantum processors as accelerators for specific, hard-to-solve problems within classical supercomputers. This approach allows users to benefit from quantum speedups without waiting for a fully fault-tolerant quantum computer. Another major trend is the development of photonic quantum computing. Unlike traditional systems that use superconducting qubits, photonic quantum computers use photons (particles of light) as qubits. This approach offers advantages in terms of stability, scalability, and integration with existing fiber optic communication networks, making it a strong contender for building a future quantum internet.

The field of quantum sensing is also experiencing a boom. As research advances, quantum sensors are becoming smaller, more robust, and more affordable. This is leading to applications in areas such as precision navigation for autonomous vehicles, medical diagnostics, and enhanced security screening.

Furthermore, the integration of quantum machine learning is a transformative trend. Researchers are exploring how quantum algorithms can be used to process vast datasets more efficiently, which could revolutionize AI and data analytics. This could lead to breakthroughs in fields such as drug discovery, climate modeling, and financial forecasting.

Finally, there's a growing focus on developing quantum-safe cryptography. As quantum computers become more powerful, they will be able to break many of today's most common encryption methods. To address this, governments and companies are investing in developing new cryptographic standards that are resistant to both classical and quantum attacks, ensuring the long-term security of digital communication.

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