



## Indian Army sets up Quantum Lab, Artificial Intelligence Centre

**For Prelims:** Quantum Computing, Artificial Intelligence, Internet-of-Things, Industrial Revolution 4.0.

**For Mains:** Applications of Quantum Technology and associated Challenges, Artificial Intelligence and its advantages and disadvantages.

### Why in News

The [Indian Army](#) has set up a [Quantum Computing Laboratory](#) and a **centre for Artificial Intelligence** in Mhow, Madhya Pradesh.

### Key Points

#### ▪ About:

- The **Quantum Computing Laboratory** has been established with the help of the [National Security Council Secretariat \(NSCS\)](#), to spearhead research and training in this key developing field.
  - National Security Council is a three-tiered organization that **oversees political, economic, energy and security issues** of strategic concern.
- Indian Army has also established an Artificial Intelligence (AI) Centre at the same institution with over **140 deployments in forward areas and active support of industry and academia.**
- Training on cyber warfare is being imparted through **a state-of-the-art cyber range and cyber security labs.**

#### ▪ Objective:

- The two Centres will carry out **extensive research in developing the transformative technologies** for use by the armed forces.
- The Centres will also **facilitate the research and training in the developing field of Quantum and artificial intelligence.**
- It will help it facilitate the next generation of communication and **transform the current system of cryptography to post-quantum cryptography.**
- The key thrust areas of Quantum Technology are [Quantum Key Distribution](#), **quantum computing and quantum communication.**
  - **QKD**, also called Quantum Cryptography, is a mechanism to develop secure communication.

### Quantum Technology/Computing

#### ▪ About:

- Quantum Technology is based on the principles of **Quantum mechanics that was developed in the early 20<sup>th</sup> century** to describe nature at the scale of atoms and elementary particles.

- Using **quantum superposition**, a set of unbreakable codes or super-speedy information processing, **quantum computers** are able to mimic several classical computers working in parallel.
  - Quantum computers **compute in 'qubits' (or quantum bits)**. They exploit the properties of quantum mechanics, the science that governs how matter behaves on the atomic scale.
- The first phase of this revolutionary technology has **provided the foundations of our understanding of the physical world, including the interaction of light and matter**, and led to popular inventions such as **lasers and semiconductor transistors**.
- **Applications:**
  - **Secure Communication:**
    - [China recently demonstrated](#) secure quantum communication links between terrestrial stations and satellites.
    - This area is **significant to satellites, military and cyber security among others** as it promises unimaginably fast computing and safe, unhackable satellite communication to its users.
  - **Research:**
    - It can help in **solving some of the fundamental questions in physics** related to gravity, black holes etc.
    - Similarly, the quantum initiative could give a big boost to the [Genome India project](#).
  - **Disaster Management:**
    - [Tsunamis, drought, earthquakes and floods](#) may become more predictable with quantum applications.
    - The collection of data regarding [climate change](#) can be streamlined in a better way through quantum technology.
  - **Pharmaceutical:**
    - Quantum computing could reduce the time frame of the discovery of new molecules and related processes to a few days from the present 10-year slog that scientists put in.
  - **Augmenting Industrial revolution 4.0:**
    - Quantum computing is an integral part of [Industrial revolution 4.0](#).
    - Success in it will help in Strategic initiatives aimed at leveraging other Industrial revolution 4.0 technologies like the [Internet-of-Things](#), machine learning, [robotics](#), and [artificial intelligence](#) across sectors will further help in laying the foundation of the Knowledge economy.
- **Challenges Associated with Quantum Computing:**
  - The dark side of quantum computing is the **disruptive effect that it can have on cryptographic encryption**, which secures communications and computers.
  - It might pose a challenge for the government also because if this **technology goes into the wrong hands, all the government's official and confidential data will be at risk** of being hacked and misused.
- **Related Indian Initiatives:**
  - Budget 2020 allocated Rs 8000 Crore to a **National Mission on Quantum Technologies & Applications (NM-QTA)** for a period of five years.
  - In 2018, the Union Cabinet approved the launch of the **National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS)** to make India a leading player in Cyber-Physical Systems.
  - In 2018, the government initiated serious discussions in quantum technologies and kick started research projects across 51 organisations under QUEST - **Quantum Enabled Science and Technology**. However, no significant progress is made in this field until NM-QTA.

