**St. Francis Institute of Technology, Mumbai-400 103 Department**
**Of Information Technology**

**A.Y. 2025-2026**
**Class: BE-ITA/B, Semester: VIII**
Subject: BlockChain Lab

## Experiment – 1

1. **Aim:** Case Study on Blockchain
2. **Objectives:** Students should be able to understand application areas of Blockchain Technology in the real world.
3. **Prerequisite:** Distributed systems and Security basics
4. **Requirements:** Online/Library resources
5. **Pre-Experiment Exercise:**
6. **Theory:** Write Case study on Following points
   ● **Define Blockchain:**

A blockchain is a decentralized, distributed digital ledger that records transactions across many computers so that any involved record cannot be altered retroactively. It operates as a chain of blocks, where each block contains a list of transactions, and once a block is added to the chain, it becomes permanent and accessible to all participants in the network.

   ● **Types of Blockchain:**
1. Blockchain networks can be categorized based on their access permissions and governance structures:
2. Public Blockchain: Fully decentralized and open-source, allowing anyone to join, read, and write data.
3. Private Blockchain: Restricted to a single organization where a central entity controls who can participate and view the ledger.
4. Consortium Blockchain: A semi-decentralized model where a group of organizations manages the network.
5. Hybrid Blockchain: A combination of private and public features, allowing organizations to keep certain data private while sharing other data on a public ledger for transparency.
   ● **Features of Blockchain:**
The transformative power of blockchain comes from its unique structural features:
1. Decentralization: No single central authority controls the network; control is distributed among all participants.
2. Immutability: Once data is written and confirmed, it is nearly impossible to change or delete without altering all subsequent blocks.
3. Transparency: All participants have access to a copy of the ledger, ensuring that every transaction is visible and verifiable.
4. Consensus-Based: The network relies on mathematical algorithms to agree on the validity of transactions before they are added.

   ● **Security in Blockchain:**
Blockchain security is maintained through a combination of cryptographic techniques and network protocols:
1. Cryptographic Hashing: Each block contains a unique digital fingerprint (hash) and the hash of the previous block, creating a secure link that makes tampering easily detectable.
2. Digital Signatures: Transactions are signed using private keys to prove ownership and ensure that the sender's identity cannot be forged.
3. Distributed Consensus: Protocols like Proof of Work (PoW) or Proof of Stake (PoS) prevent malicious actors from taking over the network by requiring significant computational power or stake.
4. Immutable Records: The permanent nature of the ledger ensures that historical data cannot be manipulated to cover up fraudulent activity.

7. **Laboratory Exercise Procedure**
   A. Refer to any authenticated web reference to complete the following tables

| S.no | Application Domain | Real Life Application |
|------|--------------------|------------------------|
|      |                    |                        |

| 1. | Banking | **Ripple (XRP):** Enables real-time, low-cost international payments. |
|---|---|---|
| 2 | Healthcare | **Medicalchain:** Uses blockchain to securely store and share electronic health records. |
| 3 | Taxation | **VAT Compliance:** Several EU countries use blockchain to track VAT in real-time to prevent fraud. |
| 4 | Insurance | **Etherisc:** Decentralized insurance platform for automated flight delay payouts. |
| 5 | Gaming | **Axie Infinity:** A "play-to-earn" game using NFTs for in-game assets. |
| 6 | Mobile Payment | **BitPesa:** Facilitates B2B payments and foreign exchange in African markets. |
| 7 | IOT | **Helium:** A decentralized wireless network for IoT devices. |
| 8 | Governance | **Estonia E-Governance:** Uses KSI Blockchain to protect national data registries. |
| 9. | Border security | **Known Traveller Digital Identity (KTDI):** Paperless travel between borders using biometric and blockchain data. |
| 10 | Music | **Arbit:** It is a blockchain based project led by former Guns N Roses drummer Matt Sorum seeking a fairer way to reward musicians for their creative efforts. |

- Find and Study open source tools used for blockchain applications.

| S.no | Assignment | Open-Source Tool |
|---|---|---|
| 1. | To implement basic hash chain | CryptoJS (JavaScript library) or Python's hashlib. |
| 2 | Basic Ethereum Transactions | MetaMask (Wallet) and Ganache (Personal Blockchain). |
| 3 | Implement Smart Contracts | Remix IDE and Truffle Suite. |
| 4 | Languages used for Blockchain platform | Solidity (for Ethereum), Go, or C++. |

**8.    Post-Experiments Exercise:**
   A.  Extended Theory:
   B.  Advantages of Blockchain:
   C.  Limitations and Challenges of Blockchain:

**9.    Conclusion:**
Blockchain technology demonstrates the potential to fundamentally transform traditional industries, whether they are financial or non-financial. By leveraging its core features of decentralization, immutability, and transparency, it provides a secure and verifiable framework for real-world applications ranging from global banking to healthcare and e-governance. Ultimately, its ability to record transactions permanently across a distributed network ensures a level of trust and security that can redefine how modern systems operate.

**10.    References:**
[1] e-Estonia. Security: KSI Blockchain. This serves as the primary reference for the Estonia E-Governance case study, detailing how national data registries are protected.
[2] Everledger. Blockchain for Diamond Provenance. This reference supports the case study on supply chain transparency and tracking high-value assets.
[3] World Food Programme (WFP). Building Blocks. This provides the background for the "Humanitarian Aid" case study, explaining how blockchain is used for cash transfers to refugees.