

**Dr.SNS RAJALAKSHMI COLLEGE OF ARTS AND SCIENCE
(Autonomous)**

**Accredited by NAAC - UGC with 'A+ Grade (Cycle IV)
(Recognized by UGC, Approved by AICTE & Affiliated to Bharathiar University)
Coimbatore- 49**

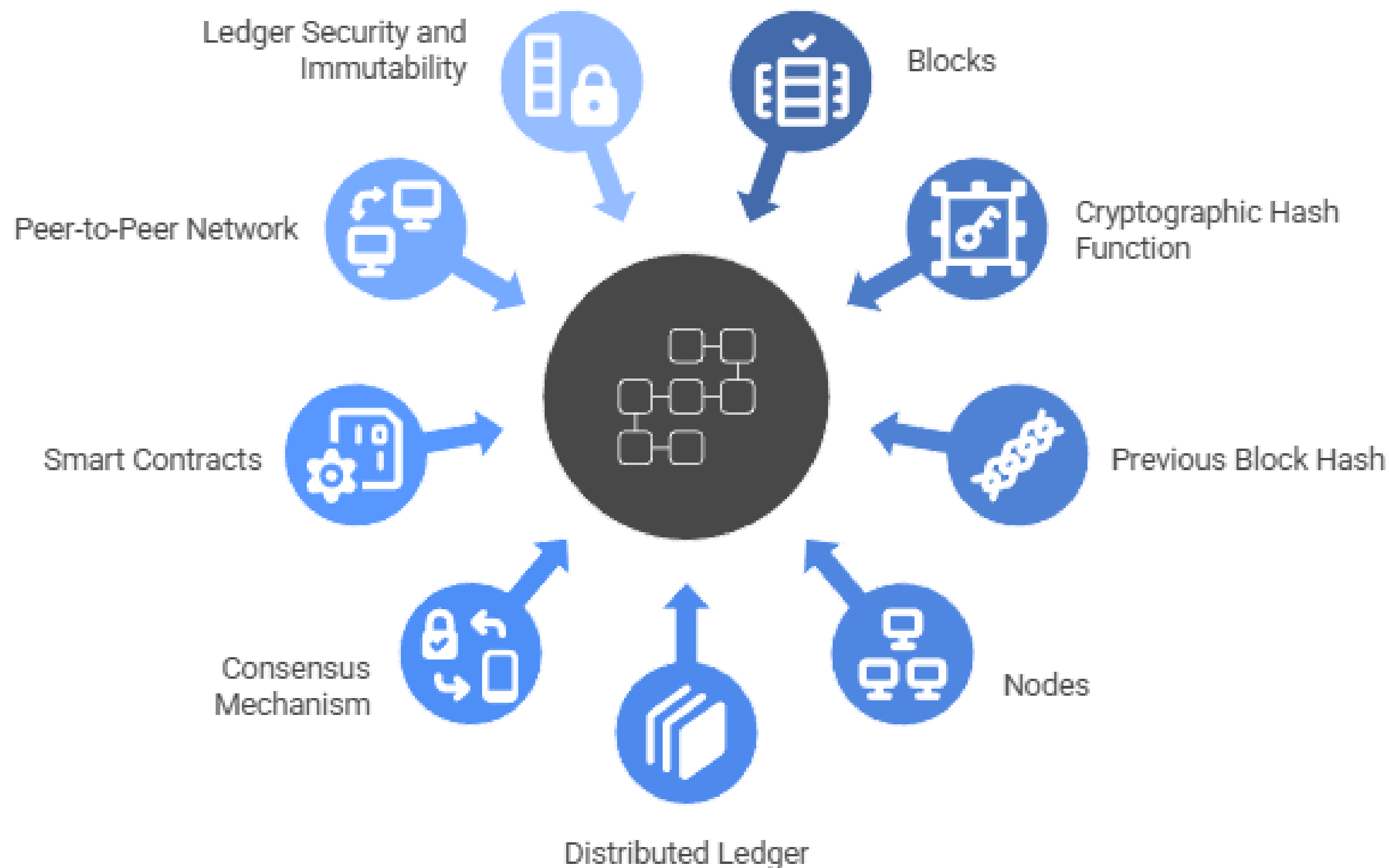
**DEPARTMENT OF COMMERCE WITH INFORMATION
TECHNOLOGY**

**21UCI505 – BLOCKCHAIN AND DISTRIBUTIVE
LEDGER**

**Unit-2: Key Components of a Blockchain Architecture
and Their Functions**

**Ms. S.Meenakshi, Assistant Professor
Department of Commerce with Information Technology**

Components of a Blockchain Architecture



1. Blocks

A block is the fundamental data structure in a blockchain. It contains a list of transactions, a timestamp, a nonce, and the hash of the previous block. Blocks group transactions together and ensure they are recorded permanently.

Example: In the Bitcoin blockchain, each block stores thousands of Bitcoin transaction records along with the hash of the previous block.

2. Cryptographic Hash Function

A cryptographic hash function converts input data into a fixed-length string called a hash. It ensures data integrity, as even a minor change in data results in a completely different hash value.

Example: Bitcoin uses the SHA-256 hash function to secure transaction data and link blocks.

3. Previous Block Hash

Each block contains the hash of the preceding block, creating a secure chain. This linking makes the blockchain tamper-proof because altering one block would require changing all subsequent blocks.

Example: If a transaction in Block 5 is altered, the hash stored in Block 6 becomes invalid.

4. Nodes

Nodes are computers that participate in the blockchain network. They store copies of the blockchain, validate transactions, and ensure network security and decentralization.

Example: A full Ethereum node verifies all transactions and maintains the entire Ethereum ledger.

5. Distributed Ledger

The distributed ledger is a shared database that is replicated across all nodes in the network. It removes the need for a central authority and improves transparency.

Example: In a supply chain blockchain, all participants can view the same shipment records in real time.

6. Consensus Mechanism

A consensus mechanism is a protocol used to achieve agreement among nodes on the validity of transactions. It prevents fraud and double spending.

Example: Bitcoin uses Proof of Work, while Ethereum (post-merge) uses Proof of Stake.

7. Smart Contracts

Smart contracts are self-executing programs stored on the blockchain that automatically enforce predefined conditions and rules.

Example: In Ethereum, a smart contract automatically releases payment when goods are delivered.

8. Peer-to-Peer Network

Blockchain operates on a peer-to-peer network where nodes communicate directly without intermediaries. This enhances decentralization and resilience.

Example: Bitcoin nodes broadcast transactions to other nodes without a central server.

9. Ledger Security and Immutability

Once data is recorded and validated, it cannot be altered or deleted. This ensures long-term data reliability and trust.

Example: Financial audit records stored on a blockchain cannot be manipulated after approval.

These components work together to create a secure, decentralized, and transparent system. By combining cryptography, consensus, and distributed networking, blockchain architecture enables trustworthy digital transactions without relying on central authorities.

THANK YOU