Centurion University
Shaping Lives... Empowering Communities...

School: ..... Campus: .....

Academic Year: ..... Subject Name: ..... Subject Code: .....

Semester: ..... Program: ..... Branch: ..... Specialization: .....

Date: .....

# Classroom Learning

(Learning by Listening and Observations)

## Name of the Topic: Nodes

## Learning Outcome:

### Concepts learned (Mention 2/3 principles):

Based on the classwork, the principal concepts I have learned include:

1. The fundamental concept of a blockchain node as a stakeholder's device that maintains a copy of the distributed ledger and participates in the network.
2. The complete architecture of blockchain networks, distinguishing between full nodes, lightweight nodes, and miner nodes.
3. The characteristics of node consensus mechanisms, primarily Proof-of-Work (PoW) and Proof-of-Stake (PoS), which ensure data integrity and security.

### * New techniques learned:

Additionally, I have acquired new knowledge in the following areas:

1. Techniques for how nodes use cryptographic hashes (like SHA-256) to link blocks and create an immutable chain.
2. Procedures for how nodes communicate and propagate new transactions and blocks across the peer-to-peer network.
3. The process of transaction validation and block verification performed by nodes to achieve consensus without a central authority.
4. The concept of a "genesis block" and how nodes initialize their copy of the blockchain.

## * Related Project/Practice work experienced and learned:

During the practice sessions of the lab work, I engaged in and developed proficiency with programs and simulations in the following areas:

1. Creating a basic structure for a block containing index, timestamp, data, previous hash, and current hash.
2. Simulating a simple blockchain with multiple nodes that can accept transactions and mine new blocks.
3. Writing algorithms to demonstrate proof-of-work (mining) and the importance of the longest chain rule.
4. Creating a basic consensus protocol to handle conflicts between different node chains.

## * New Software/Machine/Tool/Equipment/Experiment learned:

- Got exposure to **Bitcoin Core** as an example of running a full node.
- Learned about tools like **Geth (Go-Ethereum)** for deploying Ethereum nodes.

## * Application of concept(s) (preferably real life scenario):

1. **Full Nodes:** Run by enthusiasts and businesses to enforce the rules of a cryptocurrency like Bitcoin or Ethereum, providing security and decentralization.
2. **Mining Nodes:** Specialized nodes that compete to solve complex mathematical problems to add new blocks to the chain and earn rewards (in PoW systems).
3. **Lightweight (SPV) Nodes:** Used in cryptocurrency wallets on phones and computers to verify transactions without storing the entire blockchain, enabling everyday use.

## * Case Studies/Examples:

1. **Bitcoin Network:** A global network of thousands of nodes maintains and secures the Bitcoin ledger, making it censorship-resistant and trustless.
2. **Supply Chain Tracking:** Companies like IBM Food Trust use a permissioned blockchain where nodes are operated by farmers, processors, and retailers to track food provenance.
3. **Decentralized Finance (DeFi):** Applications are built on blockchain networks where nodes execute smart contract code to facilitate lending, borrowing, and trading without intermediaries.

***Assessment:***

***Marks Obtained: ..... / 10***

***Signature of the Faculty:***

***Signature of the Student:***

***Name :*** PN Archana

***Regn. No. :*** 240720100147



**As applicable according to the topic.*
*One sheet per topic (10-20) to be used.*