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

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

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

Date: .....

Applied and Action Learning

(Learning by Doing and Discovery)

Name of the Experiement : Hash Your First Block - Blockchain Basics and Setup

Objective/Aim:

To understand how hashing works in blockchain, learn to create and mine your first block through proof-of-work, and observe how blocks link together in a chain. We'll be using andersbrownworth's interactive demo as our foundation.

Apparatus/Software Used:

- Laptop
- andersbrownworth.com

Theory/Concept:

Hashing: A hash acts like a digital fingerprint of data; even a tiny change in input produces a drastically different output. Hash outputs (via SHA-256) are always fixed-length and extremely sensitive to input changes.

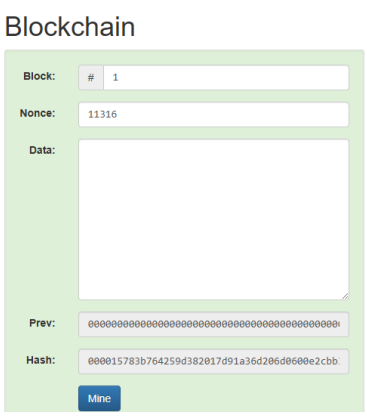
Block Structure: A block combines a block number, a nonce (arbitrary number), and the data payload. The combined block content is hashed. If the hash begins with a certain number of zeros (e.g., four), the block is considered "signed" or valid.

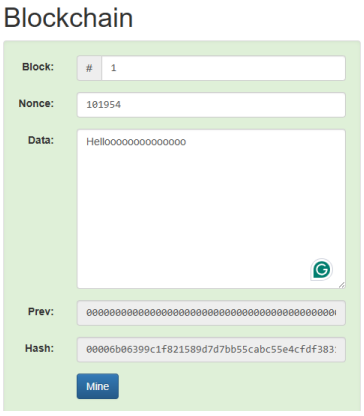
Proof-of-Work: Mining involves adjusting the nonce repeatedly until the hash meets the network's difficulty requirement (like starting with "0000…").

Blockchain Formation: Each block includes the hash of the previous block, creating an immutable chain—any change in an earlier block breaks the chain unless all subsequent blocks are re-mined

Procedure:

- Step 1: The process begins with a valid block highlighted in green. This could either be the very first block (known as the genesis block) or any block that has already been mined. A valid block must have a hash that starts with four zeros (0000…). Initially, this block contains no data and has a default nonce value, for example, 72608.
- Step 2: When we add some information (e.g., “Genesis Block”) into the data field, the hash of the block changes. As a result, the block turns red, indicating that it is no longer valid because its hash no longer starts with the required four zeros.
- Step 3: To make the block valid again, mining is required. Mining involves testing different nonce values until one is found that, when combined with the rest of the block’s data, generates a hash that satisfies the rule (i.e., beginning with four zeros).
- Step 4: Once a suitable nonce is discovered through mining, the block regains validity and turns green again. This indicates that the block has been successfully mined and now forms part of the blockchain.





Observation Table:

Step	Observation
Hash "hello"	Unique 64-char hash generated
Modify input to "hello!"	Hash completely different, showing high sensitivity
Mining a block	Mining button finds a nonce giving hash with four leading zeros
Tampering with block data	Breaking block invalidates that block and subsequent blocks in the chain
Remining strategy	Re-mine each affected block in sequence to restore chain integrity

Rubrics	Full Mark	Marks Obtained	Remarks
Concept	10		
Planning and Execution/ Practical Simulation/ Programming	10		
Result and Interpretation	10		
Record of Applied and Action Learning	10		
Viva	10		
Total	**50**		