	School: .... Campus: ....
Centurion **UNIVERSITY** *Shaping Lives... Empowering Communities...*	Academic Year: .... Subject Name: .... Subject Code: .... Semester: .... Program: .... Branch: .... Specialization: .... Date: ....

Applied and Action Learning
(Learning by Doing and Discovery)

Name of the Experiement : Mine It – Basic Proof-of-Work Simulation

Objective/Aim:

To demonstrate the **Proof-of-Work (PoW)** concept by performing a basic mining simulation. The aim is to repeatedly modify a nonce value and hash the block data until the generated hash fulfills a given **difficulty target** (for example, starting with a specific number of zeros).

Apparatus/Software Used:

- Laptop
- Word for documentation,
- Proof of work simulator
- Internet for research

Theory/Concept:

Proof-of-Work (PoW) is a **consensus mechanism** used in blockchain networks to confirm transactions and add new blocks to the chain. It requires participants (miners) to solve a computational puzzle — finding a hash value that meets a defined difficulty condition.

Key Concepts:

- **Hash Function (SHA-256):**
  A cryptographic algorithm that converts any input into a fixed-length output. Even a minor change in input produces a completely different hash, ensuring data integrity and unpredictability.
- **Nonce:**
  A numeric value that miners continuously alter to find a hash meeting the target requirement.
- **Difficulty:**
  It determines how challenging it is to discover a valid hash. A higher difficulty means the hash must begin with more leading zeros, requiring more computational attempts.
- **Target Value:**
  A threshold that the valid hash must be smaller than. In this experiment, the rule "hash starts with k zeros" is used to represent the target.
- **Mining Process:**
  The miner keeps increasing the nonce and re-hashing the data until a hash is found that matches the desired difficulty level.

In essence, PoW confirms that computational work has been performed, making it costly to tamper with blockchain records.

Procedure:

Step 1: Launch the **Proof-of-Work Simulator** in a browser using this link:
https://blockchain-academy.hs-mittweida.de/2021/05/proof-of-work-simulator/
Step 2: In the first block, enter any desired data in the Data field.
Step 3: Click **"Mine"** to start the mining operation. The simulator will vary the nonce until it generates a hash that satisfies the given difficulty level.
Step 4: Observe the resulting **nonce value**, **hash output**, and **time taken** for successful mining.
Step 5: Continue until all five blocks in the simulator have been mined successfully, noting the nonce, hash, and difficulty for each block.

Observation:

Consistent Output: For the same input, SHA-256 always generates the same hash value. Even a single change—whether a
letter, number, punctuation, or space—produces a completely different hash.

Avalanche Effect: A tiny change in the input results in a drastically different output, making patterns impossible to predict.

Irreversibility: The SHA-256 algorithm is irreversible; it is computationally infeasible to retrieve the original input from the hash.

ASSESSMENT

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		

Signature of the Faculty:

Signature of the Student:

Name :

Regn.

No.