**Unit 4 – Blockchain and Decentralized Applications**

**Lab 5 Manual**

**Objective:**

In this lab, students will learn and implement inheritance and mappings across inherited contracts for data management.

By the end of this lab, students will be able to:

* Reuse code by allowing contracts to derive properties and functions from other contracts using inheritance.
* Override parent contract functions in derived contracts and understand how to customize behaviour.
* Use mappings effectively within inherited contracts to manage data structures across different contract layers.
* Call parent contract functions explicitly using the super keyword and understand its significance.
* Understand the internal and external function modifiers and learn when and how to use them effectively in inheritance scenarios.
  1. Basics of inheritance

A computer screen shot of text

Description automatically generated

* 1. Mapping with Inheritance

A computer screen shot of code

Description automatically generated

* 1. Accessing Parent State Variables

A computer screen shot of text

Description automatically generated

* 1. The use of super keyword: The super keyword is useful in cases of multiple inheritance, where the child contract needs to ensure that the correct parent contract's function is called.

A screen shot of a computer code

Description automatically generated

* 1. Super keyword

A computer screen shot of text

Description automatically generated

* 1. Internal vs. External Functions: *internal* functions can only be accessed within the contract or derived contracts, whereas *external* functions are callable only from outside the contract.

A computer screen shot of text

Description automatically generated

* 1. Internal vs. External Functions

A computer screen shot of text

Description automatically generated

**Lab Task**

Develop a decentralized library management System:

**Concepts Used:**

* *Inheritance:* Base contract for library features and derived contracts for specific types of libraries (e.g., physical books, eBooks).
* *Mapping:* To manage book inventory or track borrower details.
* *Internal vs. External:* Internal functions for managing book data and external functions for user interactions.

**Details:**

* Create a base contract for adding and tracking books.
* Use derived contracts for different types of libraries (e.g., university library, community library).
* Add functionality for issuing and returning books.
* Track users who borrowed books using mappings.

**Some More:**

1. Inheritance

A screenshot of a computer program

Description automatically generated

1. We does not need a object of parent class, we directly access the public and internal visible functions in the child contract. Note that external function only usable from other contracts not in child nor in that contract which is declared.

A screenshot of a computer program

Description automatically generated