Fund12_Plan of the course

A. Goal

- Understand how to design and build an automation testing framework for smart contract on Cardano.
- Become proficient in writing, executing, and reporting test cases for smart contracts.
- Use the tools: Lucid, Blockforst, Bun and TypeScript.

B. Audience

- QC Engineers and Automation Engineers wanting to learn about Smart Contract testing
- Developers and those interested in testing on the Cardano blockchain

C. Expectations

- Build and implement a modular testing framework for Cardano Smart Contracts.
- Develop test scripts using Typescript and Lucid.
- Create transactions using Blockfrost, Lucid and TypeScript.
- Execute tests and validate them using Bun and TypeScript.

D. Pre-requirements

- Basic understanding of blockchain and smart contract concepts.
- Familiarity with JavaScript/TypeScript.
- Access to Node.js and a Blockfrost API key for Cardano Blockchain interation.
- Experience using external wallets like Eternl for interacting with the Cardano blockchain.

E. Course Structure

Each module, lecture and practival guide will be structured into dedicated wiki pages, allowing for easier access, updates, and student collaboration.

This method enables studentsto access a comprehensive set of resources and exercies, while tracking proccess and providing immediate references.

Module 1: Introduction to Blockchain, Smart Contracts and their testing challenges.

- **Learning Objectives:**
  - Understand the fundamentals of blockchain and smart contracts.
  - Setup the environment for testing Cardano smart contracts.
- **Learning Activities:**
  - **Lecture:** Introduction to blockchain and smart contract technology (via wiki page)
  - **Hands-On Setup:** Step-by-step guide to install and configure Node.js, Lucid, Blockfrost and Typescript.
  - **Quiz**: A short multiple-choice quiz to test basic knowledge of blockchain and smart contracts.
- **Materials**:
  - **Installation Guide Wiki page**: Introductions for setting up tools likes Lucid, Blockfrost,Bun and TypeScript.
  - **Documentation links**: links to official docs for Lucid, Blockfrost, Bun and Typescript.
  - **Test Wallet**: Set p a Cardano wallet using Eternl for interacting the blockchain.
  - **Sample Blockchain Data**: Example of transactions and contracts to experiment with during the setup.

Module 2: Learn to design and organize a Testing framework

- **Learning Objectives:**
  - Develop test cases within an simple automated testing framework.
  - Understand the key sub-modules: transaction builer, test script generator, and test runner.
  - Gain a basic understanding of the programming languages and tools used: TypeScript, Lucid, and Blockfrost.
- **Learning Activities:**
  - **Framework Walkthough:** A detailed lecture (via wiki page) introduction the design of the existing test framework.
  - **Hands-On Practice**: Design and implement simple test cases using the existing test framework structure (via wiki page).
  - **Language Learning:** a short tutorials on TypeScript, Lucid and Blockfrost.

- **Materials:**
    - **Framework Documentation:** A detailed wiki page explaining the structure, components, and usage of the automation test framework.
    - **Example Test Cases:** Pre-written examples showing how to write test cases using the framework.
    - **Example a transaction:** Pre-written examples showing how to define test cases from this transaction.
    - **Tutorials:** Basic wiki-based tutorials convering essential concepts in TypeScript, Lucid, and Blockfrost.
    - **Code Editor:** Use Visual Studio Code with a step-by-step guide for setting up the environment.
    - **Blockfrost API Key**: Instuctions for obtaining and using an API Key to interact with the Cardano Blockchain.

Module 3: Writing test scripts to interact with smart contracts using Typescript and Lucid

- **Learning Objectives:**
    - Write test scripts to interact with Cardano smart contracts.
    - Utilize Lucid for transaction building for on-chain logic.
- **Learning Activities:**
    - Lecture: Introduction to Lucid and Blocfrost for on-chain testing (via wiki page)
    - **Hands-On Practice**: Write and execute test scripts to build Cardano transactions and validate smart contract logic.
    - **Quiz**: Multiple-choice questions on Lucid and Blockfrost functionally.
- **Materials**:
    - **Sample Smart Contracts:** Example scripts for Lucid and Blockfrost interaction.
    - **Step-by-Step Guides:** Wiki page guide for writing test scripts with Lucid and Blockfrost.
    - **Code Editor:** Use Visual Studio Code for writing scripts.
    - **Lucid documentation:** Detailed reference material on Lucid for building transactions.

Module 4: Executing Tests using Bun

- **Learning Objectives:**
    - Execute and validate test scripts using Bun's testing framework.
    - Handle errors and debug test results effectively.
- **Learning Actitivities:**
    - **Lecture**: Overview of using Bun Test for the testing framework.(via wiki page).
    - **Hands-On Lab**: Run test scripts in Bun, handle transaction execution errors, and validate outcomes.
    - **Quiz**: a quiz to reinforce key debugging concepts.
- **Materials**:
    - **Bun documentation**: Offical Bun documentation for writing and running tests.
    - **Sample Test Cases:** Pre-written test cases that include both working and buggy examples.
    - **Debugging Guide**: Tips and best practices for debugging issues during script execution.
    - **Testing Checklist**: A list of checks to perform before, during, and after test script execution.

F. Feedback Collection

- Comment Sections: Each wiki page will have comment sections where students can leave feedback, ask questions or provide suggestions for improvements.
- End-of-Course Survey: A comprehensive survey will be conducted at the end of the course to gather feedback on the course structure, content and intructor interaction.

G. Course Length

- Module 1-4: Each module takes approvimately 1 week (~ 5 hours of effort) to complete, including lectures, hands-on exercises, and quizzes.
- Total Course length: Approvimately 4 -5 weeks.