

## **Blockchain Development on Celo – Homework/Assignments**

This document outlines the homework and assignments for the **Blockchain Development on Celo** course. Each homework is designed to help you familiarize yourself with the concepts before we cover them in class. Please complete each assignment before the corresponding session to maximize your learning experience.

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### **Assignment 1: Introduction to Blockchain Concepts**

#### **Topics to Review:**

- What is Blockchain?
- Core concepts: Decentralization, Distributed Ledger, Peer-to-Peer Networks.
- Types of blockchains (Public, Private, Consortium).
- Consensus mechanisms: Proof of Work (PoW), Proof of Stake (PoS), Delegated PoS (DPoS).

#### **Homework:**

1. Research the basic principles of blockchain technology and write a short summary (300-400 words) explaining:
  - How a blockchain works.
  - The role of consensus mechanisms in maintaining the integrity of the blockchain.
  - At least one real-world use case of blockchain technology.
2. Identify one example of a public blockchain and one example of a private blockchain. Compare their differences.

#### **Deliverable:**

Submit a 1-page document summarizing your research via **Google Classroom**. Will be shared in class.

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### **Assignment 2: Introduction to Celo**

#### **Topics to Review:**

- Overview of Celo and its mission for financial inclusion.
- Celo architecture: Proof of Stake (PoS) and Validator nodes.
- Celo stablecoins (Celo Dollar, Celo Euro).
- Comparison between Celo, Ethereum, and Binance Smart Chain.

**Homework:**

1. Watch this introductory video on the Celo platform: [Celo Introduction Video](#).
2. Write a brief summary (200-300 words) explaining:
  - What makes Celo different from other blockchains (such as Ethereum).
  - The role of stablecoins (cUSD, cEUR) within the Celo ecosystem.
3. Research one use case where Celo has been applied to promote financial inclusion in underserved communities. Provide a short description of this project.

**Deliverable:**

Submit a 1-2 page document with your summary and research findings via **Google Classroom**. Will be shared in class.

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**Assignment 3: Solidity Programming Basics****Topics to Review:**

- What is Solidity and its use in smart contract development?
- Data types in Solidity (integers, booleans, strings).
- Control structures (if-else, loops) and functions.

**Homework:**

1. Visit Remix IDE and explore the interface.
2. Create a basic Solidity contract that defines a simple state variable (e.g., storing a message) and a function to update the variable.
3. Write a short reflection (200-300 words) describing:
  - Your experience using Remix IDE.
  - A brief explanation of the contract you wrote.
  - Any challenges you faced while writing the contract.

**Deliverable:**

Submit the code for your contract and the reflection document via **Google Classroom**. Will be shared in class.

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**Assignment 4: Tools for Celo Development****Topics to Review:**

- Required development tools: Node.js, npm, Git, Visual Studio Code.

- Overview of Celo Developer Tools (ContractKit, CLI).
- Testing smart contracts using MetaMask and Celo Wallets.

**Homework:**

1. Install the necessary development tools on your machine (Node.js, npm, Git, and Visual Studio Code). You can follow these official guides:
  - Node.js Installation
  - [Git Installation](#)
  - [Visual Studio Code Installation](#)
2. Follow the official documentation to install the Celo CLI and ContractKit:
  - Celo CLI Installation Guide
  - ContractKit Installation Guide
3. Write a step-by-step guide (200-300 words) documenting your process of setting up these tools and preparing your development environment for Celo blockchain development.

**Deliverable:**

Submit the guide and confirm that your development environment is set up via **Google Classroom**. Will be shared in class.

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**Assignment 5: dApp Development on Celo****Topics to Review:**

- Using ContractKit to interact with the Celo blockchain.
- Integrating Celo Wallet for authentication.
- Writing a smart contract that performs basic token transfers.

**Homework:**

1. Read through Celo's ContractKit documentation: ContractKit Documentation.
2. Write a simple Solidity contract that enables token transfers between two addresses.
3. Test the contract using the Alfajores Testnet. Use the Celo Faucet to acquire test tokens.
4. Write a brief summary (200-300 words) explaining your experience of writing and testing the contract.

**Deliverable:**

Submit the contract code and summary via **Google Classroom**. Will be shared in class.

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## Capstone Project: Final dApp Development Assignment

### Objective:

Build a fully functional decentralized application (dApp) on Celo that integrates:

- Smart contracts.
- Celo Wallet for user authentication.
- Token transfer functionality (using cUSD or cGLD).

### Homework:

1. Design and plan your dApp's core functionality.
2. Develop the smart contracts for your dApp using Remix IDE and deploy them to the Alfajores Testnet.
3. Use ContractKit to interact with your dApp's smart contracts from a web interface.
4. Write a project report (500-700 words) detailing:
  - Your dApp's purpose and features.
  - The technical process of developing and deploying the dApp.
  - Challenges and solutions you encountered during development.

### Deliverable:

Submit the project code, a link to the deployed dApp (on Alfajores Testnet), and the project report via **Google Classroom**. Will be shared in class.