



Blockchain Developer

Become a blockchain developer

TERM 1: FUNDAMENTALS

Project 1: Managing your Blockchain Identity

Blockchains are a public record of completed value transactions. These transactions often contain sensitive data such as personally identifiable information—so how does the blockchain secure against this information leaking into the wrong hands? In this project, you will get a chance to create your own blockchain “identity” and see how it is used to solve this issue.

Your blockchain “identity” is an encrypted private-public key pair that allows you to anonymously interact with information on the blockchain while still allowing others to verify your data. In this project, you will generate a private-public key pair and learn how to use it to securely authenticate your identity for the transactions you post.

Supporting Lesson Content: Blockchain ID

Lesson Title	Learning Outcomes
BLOCKCHAIN BASICS	<ul style="list-style-type: none">→ Learn to identify the purposes and characteristics of blockchain, bitcoin, and cryptocurrencies→ Be able to explain core components that make a blockchain secure and powerful→ Learn to diagram the relationship between a private key, public key, and wallet address→ Create a new wallet, and restore a wallet using wallet words and private keys
MANAGING BLOCKCHAIN TRANSACTIONS	<ul style="list-style-type: none">→ Learn how a simple transaction occurs between 2 entities (e.g. Bob and Alice) using a private key, public key, wallet, and a public blockchain→ Learn to manage blockchain identity and establish proof of ownership with blockchain transactions, without the need to provide sensitive information.

Project 2: Creating Your Own Private Blockchain

A blockchain is essentially a shared database that features added immutability as a safe and accurate alternative to existing data storage methods. You'll learn the nuts-and-bolts of how the blockchain data model works by creating your own private blockchain.

In this project, you will learn the fundamentals of architecting a collection of data into a blockchain data model. You'll configure how each block stores data, learn how blocks are validated in order to add new ones to the chain, and create methods to validate the chain integrity.

Supporting Lesson Content: Blockchain Data

Lesson Title	Learning Outcomes
BLOCKCHAIN: DATA OVERVIEW	→ Learn to describe the general concepts of a blockchain data model
BLOCKCHAIN INTERACTION: BITCOIN CORE INTRO	→ Be able to identify the tooling available to explore the Bitcoin Core public blockchain
BLOCKCHAIN INTERACTION: BITCOIN CORE TESTNET	→ Be able to explain the benefits of utilizing the Bitcoin Core testnet → Understand the difference between the public testnet and regression testing
BLOCKCHAIN DATA	→ Be able to diagram the relationship between the transaction lifecycle using Bitcoin Core, focusing on the boundaries with embedding data
BLOCKCHAIN INTERACTION: PRIVATE BLOCKCHAINS	→ Learn how to explain the value of a private blockchain, and prepare for the course project

Project 3: Migrate Your Private Blockchain to Your API Web Service

For a private blockchain to be valuable, it will need to integrate with a web service so the information is consumable for client applications.

For this project, you'll create a back end API web service and migrate your private blockchain to the web service you create. In the process, you'll learn how to post new blocks to the blockchain via a RESTful web client, and learn how to validate blockchain health. By the end of the project, your private blockchain will transform into a valuable web service.

Supporting Lesson Content: Blockchain Web Services

Lesson Title

Learning Outcomes

BLOCKCHAIN WEB SERVICES

- Learn how to use and build blockchain web services with Bitcoin Core Remote Procedure Call utilizing Node.js.
- Understand the difference between debug and terminal consoles

Project 4: Build Your Own Private Blockchain Notary Service

One of the most important features of a blockchain that ensures data security is the ability for a transaction on the blockchain to be signed and validated. Given the distributed nature of blockchain, signing and validation are vital to securing information.

Data stored on a blockchain can vary from digital assets (e.g. documents, media) to copyrights and patent ownership. These pieces of data need to be reliably secured, and require a way to prove they exist—this is where signing and validation are key.

For this project, you will build a blockchain notary service API that can be used to secure digital assets. The project will focus on building out the back end infrastructure with a pre-developed front end. You will learn how to encrypt and decrypt the target data (into a digest) and how to publicly prove who rightfully owns it. You will also configure your notary web service using a RESTful web client to post new blocks to the blockchain. Along the way, you will also explore how to handle the limitations of block size when handling digital data.

Supporting Lesson Content: Blockchain Web Services

Lesson Title

Learning Outcomes

BLOCKCHAIN WEB SERVICES: IDENTITY

- Be able to explain how to implement blockchain identity services to secure data with a blockchain web service
- Learn the various generations of blockchains platforms

Project 5: Build Your Own Notarization API with Ethereum Blockchain

Here, we will move from Bitcoin to Ethereum blockchain. You will build a smart contract, create a notary service, and deploy it on Ethereum blockchain. This service is designed to demonstrate how to secure any digital asset (not limited to a document, deed, agreement, media, etc.) and implement proof of existence on blockchain. This service will include third party libraries to interface with the smart contract and Ethereum blockchain.

You will build the necessary back end infrastructure for the notary service with a pre-developed front end. This will enable you to render the service on any modern web clients.

Supporting Lesson Content: Blockchain Smart Contracts

Lesson Title	Learning Outcomes
BLOCKCHAIN: SMART CONTRACTS	<ul style="list-style-type: none">→ Be able to create a smart contract on Ethereum. Understand the various service layers of a smart contract platform→ Learn Solidity, a Turing complete smart contract language
BLOCKCHAIN: IDENTITY & SMART CONTRACTS	<ul style="list-style-type: none">→ Understand how to establish Ethereum identity to implement a simple, smart contract on the Ethereum platform→ Learn how to embed transaction data while interacting with smart contracts

TERM 2: ARCHITECTURE & APPLICATIONS

Project 6: Architecture

In the project, you will work to improve your notarization service with new functionality by revisiting the architecture.

Your notarization service architecture will utilize the addition of a relational database to include storage of raw data, metadata, transactional information, and indexing.

You will have the opportunity to control the execution of your smart contract and reduce the dependency of client side services that interact with your smart contract. In this project, you will create your own decentralized full node and interface back end services to integrate with the Ethereum network to sign transactions, improve functionality, and control trust.

Supporting Lesson Content: Architecture

Lesson Title	Learning Outcomes
THE FIVE INGREDIENTS OF A BLOCKCHAIN	<ul style="list-style-type: none">→ Be able to identify the five ingredients of a blockchain
PLANNING BLOCKCHAIN SOLUTIONS WITH LEGACY SYSTEMS	<ul style="list-style-type: none">→ Learn to design supporting visuals with Unified Modeling Language (UML)
SECURITY & MAINTENANCE	<ul style="list-style-type: none">→ Learn to identify architecture security and maintenance risks

- Be able to describe the correct technology stack to layer services and provide software solutions

Project 7: Supply Chain & Data Auditing

A notarization service is a great way to prove ownership of a physical good and/or a digital asset.

What happens when we need to notarize products as they move from location A to B, changing hands and ownership for a period of time, as they take part in a supply chain?

In the project, you will modify your smart contract to support change of ownership, timestamp when this event occurs, and report auditing as required, as your notarized product moves through the supply chain.

Supporting Lesson Content: Supply Chain & Data Auditing

Lesson Title	Learning Outcomes
PRIVATE & PUBLIC CHAINS	→ Get an overview of private and public chains—the pros and cons, and tooling
ASSET MANAGEMENT	<ul style="list-style-type: none">→ Explore methods to support transferring product ownership and account control list→ Learn the importance of account control lists to permissioning your dataset
AUDITING DATA	→ Learn how to implement auditing methods between localized datasets with a blockchain platform

Project 8: Capstone Project

Use the skills you’ve learned on how to architect, build, test, and ship a blockchain product, to build your own public blockchain project.

For your chosen industry and customer need, you will work end to end from building your architecture (centralised, decentralised), and choosing your technology stack (front end, back end), to surfacing the protocol and blockchain features to the DApp layer, to experimenting, learning, and collaborating with other open-source projects to complete your project.

You will showcase your project with all of the assets (personas, architecture, data model, front end, back end, smart contract, etc.) that are built.

Supporting Lesson Content: Capstone

Lesson Title

Learning Outcomes

SUPPLY CHAIN & DISTRIBUTION OF PRODUCTS & SERVICES

- Be able to identify the benefits of using a public blockchain to support distribution channels

CAPSTONE PROJECT PREP

- Learn to design supporting visuals with Unified Modeling Language (UML)
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