Blockchain Developer Nanodegree Syllabus

Build projects designed in collaboration with working blockchain developers, work with the Bitcoin Core and Ethereum platforms, and build your own private blockchain.

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Before You Start

Prerequisites: Prior to enrolling, you should be able to:

- Code with object-oriented programming
- Work with asynchronous JavaScript code
- Develop the front end and back end of a web application with JavaScript
- Create and consume data using a remote API

Educational Objectives: Our Blockchain Developer Nanodegree offers the most comprehensive curriculum available for learning the fundamental skills, tooling, mindset, and security best practices that are essential to becoming a Blockchain Developer. Specifically, we will focus on:

- Fundamental transaction types
- Creating a private blockchain
- Layering blockchain services with legacy integration

Contact Info

If you have any questions, contact us at enterprise-support@udacity.com. For help from Udacity mentors and peers, please visit the Udacity classroom.

Nanodegree Program Info

TECHNICAL REQUIREMENTS

Hardware Requirements: webcam, microphone

Software and Software Version Requirements: computer running recent versions of Windows, Mac OS X, or Linux. 20+ gigabytes of free disk space, 2+ gigabytes of memory (RAM), and an unmetered broadband Internet connection.

LENGTH OF PROGRAM*: 5 months, consisting of 7 courses and 7 projects.

*This is a self-paced program and the length is an estimation of total hours the average student may take to complete all required coursework, including lecture and project time. Actual hours may vary.

Course 1: Blockchain Fundamentals

Start by learning the fundamentals of blockchain technology and create your own private blockchain. Learn basics of bitcoin platform and how to secure a digital asset using blockchain identity. Then gain deeper understanding of Ethereum platform, and use Solidity to develop, test and deploy your own decentralized app.

Continue to build on your blockchain skills with advanced topics such as privacy, security, payments, and oracles on blockchain. Architect and build complex systems on blockchain for different use cases such as supply chain tracking, insurance payments and decentralized marketplace.

Project: Create Your Own Private Blockchain

Architect a collection of data into a blockchain data model, and configure how each block stores data, validate blocks, add new blocks to the chain, and create methods to validate the chain integrity. Then create a back-end API web service, and migrate your private blockchain to the web service. In the process, you'll learn how to post new blocks to the blockchain via a RESTful web client. You'll then encrypt and decrypt the unique digital collectibles on a private blockchain.

Lesson Title	Learning Outcomes
BLOCKCHAIN BASICS	• Explain core components that make a blockchain secure and powerful • Define blockchain protocols and their key differences
MANAGING BLOCKCHAIN TRANSACTIONS	• Create and manage identity on the Bitcoin Blockchain and establish proof-of-ownership with blockchain transactions, without the need to provide sensitive information
BITCOIN CORE TESTNET	• Explain the benefits of utilizing the Bitcoin Core testnet • Describe the difference between the public testnet and regression testing
BLOCKCHAIN DATA	• Learn the relationship between different stages of transaction lifecycle using Bitcoin Core

Course 1: Blockchain Fundamentals, cont.

Lesson Title	Learning Outcomes
PRIVATE BLOCKCHAINS	• Explain the value of a private blockchain, and prepare for the course project
DIGITAL ASSETS ON BLOCKCHAIN	• Encode and decode digital assets on a private blockchain, and publicly prove ownership of the assets using digital identity

Course 2: Ethereum Smart Contracts, Tokens and Dapps

Project: Build CryptoStar Dapp on Ethereum

Build a decentralized app (Dapp) that allows you to create, sell, and transfer ownership of unique star token (CryptoStar) on the Ethereum blockchain using smart contracts and the non-fungible (ERC721) token standard. This service is designed to demonstrate how to claim and transfer ownership of unique digital asset (e.g. document, deed, agreement, media, etc.) on Ethereum blockchain. You'll build the back-end infrastructure for the CryptoStar with a pre-developed front end. This will enable you to render the service on any modern web clients.

Lesson Title	Learning Outcomes
ETHEREUM FUNDAMENTALS AND DEVELOPMENT TOOLS	• Describe the fundamentals of Ethereum and how it is different from Bitcoin • Build, compile, deploy, and test smart contracts using remix, ganache, truffle, and infura
SMART CONTRACTS WITH SOLIDITY	• Learn Solidity, a Turing complete smart contract language • Learn about different token standards (ERC-721, ERC-20) • Create a fungible (ERC-20) token on Ethereum using Solidity
ETHEREUM DAPP	• Develop, test and deploy a fully-functioning Dapp that allows users to create, buy and sell unique stars

Course 3: Blockchain Architecture

Project: Ethereum Dapp for Tracking Items through Supply Chain

By the completion of Project 2, you'll have learned the importance of Proof of Existence, which is used to verify whether a digital asset is authentic and can be trusted. In this project, you'll scale up to architect a solution that verifies authenticity for a product when multiple actors are involved.

You'll build a supply chain system on Ethereum blockchain that allows users to verify the authenticity of an item as it passes through different hands. You will architect a Dapp (Decentralized Application) authenticity management system backed by the Ethereum platform. To do so, you'll scope out the needs of the various actors in the supply chain and create smart contracts that help track product origination and verify product authenticity. You'll then tie this all together with a simple front-end that allows users to manage the product life-cycle as the product moves through the supply chain.

Lesson Title	Learning Outcomes
PLANNING BLOCKCHAIN SOLUTIONS	• Learn the correct technology stack to layer services and provide software solutions • Design supporting visuals with Unified Modeling Language (UML)
PRIVACY	• Implement several techniques to enhance privacy of blockchain such as merkle trees, zero-knowledge proofs
SECURITY & MAINTENANCE	• Identify architecture security and maintenance risks
DISTRIBUTED FILE SYSTEM	• Create your own website and Dapp on the new decentralized storage protocol

Course 4: Dapp with autonomous smart contracts and oracles

Project: Flight Delay Insurance Dapp

In the real world, many smart contracts perform actions based on external triggers. These triggers can be caused by our actions, or by data received from outside sources using what are known as “oracles.” To make real-world decentralized applications, smart contracts need to respond autonomously to these triggers, thereby making these applications more interactive.

In this project, you’ll build a decentralized application for a use case in which you have airlines that offer flight delay insurance, and passengers who carry this insurance, and who get paid in the event their flight is delayed. You’ll build multiple smart contracts which are autonomously triggered by external sources, and which handle payments based on flight delay scenarios.

Lesson Title	Learning Outcomes
MULTIPARTY CONTROL AND PAYMENTS WITH SMART CONTRACTS	• Build Dapp with secure, multi-sig smart contracts that autonomously receive, transfer, and pay funds.
ORACLES	• Utilize third-party data sources to inform autonomous smart contracts
HANDLING SMART CONTRACT PAYMENTS	• Create, and test, secure and cost-efficient smart contracts that handle, distribute, and test ETH payments to a smart contract

Course 5: Capstone

Project: Capstone Project

Here, you'll use all the new skills you've acquired to build decentralized property listing application.

In this project, you will represent your ownership of the property using ZK-SNARKs and then mint tokens to represent your claim to the property. You will then make these tokens available for sale on blockchain marketplace.

Lesson Title	Learning Outcomes
ZK-SNARKS	• Learn how to implement ZK-SNARKs using Zokarates framework

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