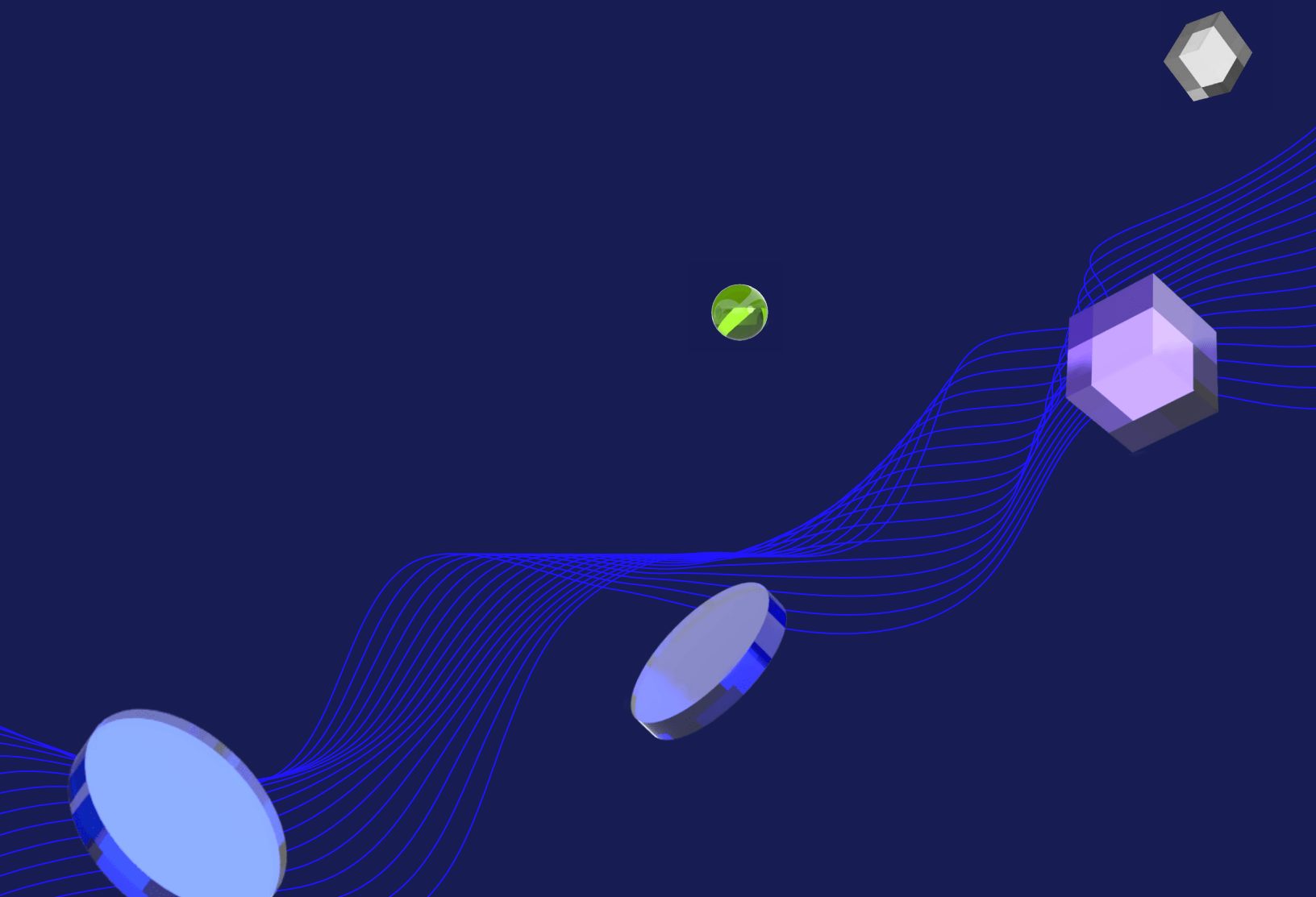
INDIVIDUAL LEARNERS

UDACITY

SCHOOL OF PROGRAMMING & DEVELOPMENT

Blockchain Developer

Nanodegree Program Syllabus



Overview

Start by learning the fundamentals of the blockchain technology and create one's 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 one's own decentralized app. Continue to build on one's 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.

Program information

Estimated Time

4 months at 10hrs/week*

Skill Level

Intermediate

Prerequisites

A well-prepared learner should have the ability to code with object-oriented programming, work with asynchronous JavaScript code, develop the front end and back end of a web application with JavaScript, and create and consume data using a remote API.

Required Hardware/Software

Learners need access to a 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.

*The length of this program is an estimation of total hours the average student may take to complete all required coursework, including lecture and project time. If you spend about 5-10 hours per week working through the program, you should finish within the time provided. Actual hours may vary.

Course 1

Blockchain Fundamentals

Learn the basics of how the blockchain data model works by creating one's own private blockchain using Node.js and Leveldb.

Course Project

Create Your Own Private Blockchain

A blockchain is a shared database that features added immutability as a safe and accurate alternative to existing data storage methods. Students will learn the basics of how the blockchain data model works by creating their own private blockchain using Node.js and Leveldb. In this project, students will learn the fundamentals of architecting a collection of data into a blockchain data model. Learners will configure how each block stores data, validate blocks, add new blocks to the chain, and create methods to validate the chain integrity.

Learners will then create a back end API web service, and migrate their private blockchain to the web service. In the process, students will learn how to post new blocks to the blockchain via a RESTful web client. Learners will then encrypt and decrypt the unique digital collectibles on a private blockchain.

Lesson 1

Blockchain Basics

- Explain core components that make a blockchain secure and powerful.
- Define blockchain protocols and their key differences.

Lesson 2

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.

Lesson 3

Bitcoin Core Testnet

- Explain the benefits of utilizing the Bitcoin Core testnet.
- Describe the difference between the public testnet and regression testing.

Lesson 4

Blockchain Data

- Learn the relationship between different stages of transaction lifecycle using Bitcoin Core.

Lesson 5

Private Blockchains

- Explain the value of a private blockchain and prepare for the course project.

Lesson 6

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 & Dapps

Advance one's blockchain skillset to the second generation of blockchain services with smart contracts utilizing the Ethereum network.

Course Project

Build CryptoStar Dapp on Ethereum

With Project 2, learners' focus moves from Bitcoin to Ethereum blockchain. They'll begin by building a decentralized app (Dapp) that allows them to create, sell, and transfer ownership of a 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.

Learners will build the back end infrastructure for the CryptoStar with a pre-developed front end. This will enable learners to render the service on any modern web clients.

Lesson 1

Ethereum Fundamentals & 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.

Lesson 2

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.

Lesson 3

Ethereum APP

- Develop, test, and deploy a fully-functioning Dapp that allows users to create, buy, and sell unique stars.

Course 3

Blockchain Architecture

Learn blockchain architecture and advanced concepts such as privacy, security, and decentralized file management.

Course Project

Ethereum Dapp for Tracking Items through Supply Chain

By the completion of Project 2, students will 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, learners will scale up to architect a solution that verifies authenticity for a product when multiple actors are involved. Learners will build a supply chain system on Ethereum blockchain that allows users to verify the authenticity of an item as it passes through different hands. Learners will architect a Dapp (decentralized application) authenticity management system backed by the Ethereum platform. To do so, learners will 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. Learners will then tie this all together with a simple front end that allows users to manage the product lifecycle as the product moves through the supply chain.

Lesson 1

Planning Blockchain Solutions

- Learn the correct technology stack to layer services and provide software solutions.
- Design supporting visuals with Unified Modeling Language (UML).

Lesson 2

Privacy

- Implement several techniques to enhance privacy of blockchain such as merkle trees, zero-knowledge proofs.

Lesson 3

Security & Maintenance

- Identify architecture security and maintenance risks.

Lesson 4

Distributed File System

- Create one's own website and Dapp on the new decentralized storage protocol.

Course 4

Dapp with Autonomous Smart Contracts & Oracles

Advance one's blockchain skill set by developing a decentralized application (Dapp) that will perform actions based on external triggers and handle payments.

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

Lesson 1

Multiparty Control & Payments with Smart Contracts

- Build Dapp with secure, multi-sig smart contracts that autonomously receive, transfer, and pay funds.

Lesson 2

Oracles

- Utilize third-party data sources to inform autonomous smart contracts.

Lesson 3

Handing 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 (Optional)

For your capstone project, learners will use all the new skills they've acquired to build decentralized property listing application.

Course Project

Capstone (Optional)

Here, learners will use all the new skills they've acquired to build decentralized property listing application. In this project, learners will represent their ownership of the property using ZK-SNARKs and then mint tokens to represent their claim to the property. They will then make these tokens available for sale on blockchain marketplace.

Lesson 1

ZK-SNARKS

- Learn how to implement ZK-SNARKs using Zokarates framework.

Meet your instructors.

Brandy Camacho

Instructor

Brandy is curriculum lead for the Blockchain Developer Nanodegree program. She was previously a lead technical project manager for Udacity. She is the founder of Network Designs, specializing in architecting software solutions.

Jessica Lin

Instructor

Jessica holds a biomedical engineering degree from Cornell University. Prior to joining Udacity, she developed and deployed enterprise healthcare technologies. She has recently taught Android development in our Nanodegree programs.

Joe Nyzio

Instructor

Joe Nyzio earned his degree in neuroscience from Temple University. At Udacity, he's been a content developer on the Data Analyst, Tech Entrepreneur, and Business Analyst Nanodegree programs.

Rachna Ralhan

Instructor

Rachna holds a bachelor's in electrical engineering and a master's in software management. She brings years of software and hardware engineering experience and has previously worked for companies such as Intel, AMD, Cypress, and Xilinx Semiconductors.

PK Rasam

Instructor

PK Rasam is founder and Chief Blockchain Officer at LINCD, specializing in blockchain strategy and distributed ledger infrastructure services. PK's focus is on creating the next breed of crypto machine intelligence-based businesses.

Nik Kalyani

Instructor

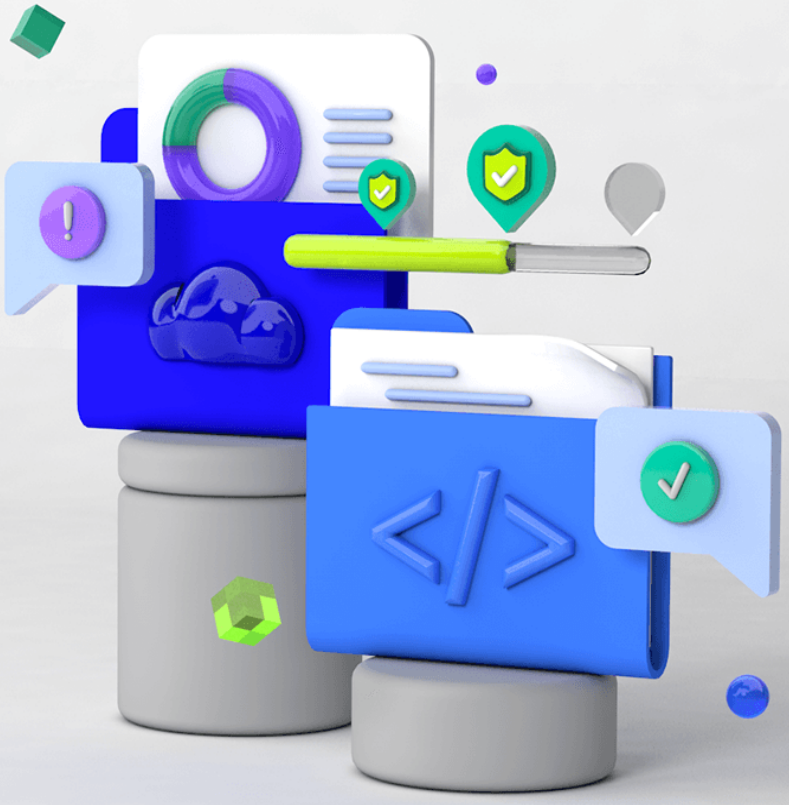
Nik Kalyani is an entrepreneur and blockchain architect. He is the co-founder and CTO of WhenHub, creator of the interface micro-contracts dApp. A Microsoft MVP, he is also the founder of TryCrypto and Walkstarter.

Elena Nadolinski

Instructor

Elena Nadolinski is currently heads down building a new privacy cryptocurrency. Previously she was a software engineer at Airbnb, Tilt, and Microsoft. Elena graduated with a degree in computer science from Virginia Tech in 2014.

Udacity's learning experience



Hands-on Projects

Open-ended, experiential projects are designed to reflect actual workplace challenges. They aren't just multiple choice questions or step-by-step guides, but instead require critical thinking.

Quizzes

Auto-graded quizzes strengthen comprehension. Learners can return to lessons at any time during the course to refresh concepts.

Knowledge

Find answers to your questions with Knowledge, our proprietary wiki. Search questions asked by other students, connect with technical mentors, and discover how to solve the challenges that you encounter.

Custom Study Plans

Create a personalized study plan that fits your individual needs. Utilize this plan to keep track of movement toward your overall goal.

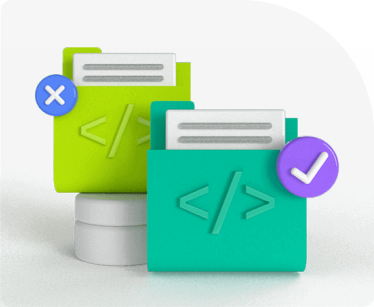
Workspaces

See your code in action. Check the output and quality of your code by running it on interactive workspaces that are integrated into the platform.

Progress Tracker

Take advantage of milestone reminders to stay on schedule and complete your program.

Our proven approach for building job-ready digital skills.



Experienced Project Reviewers

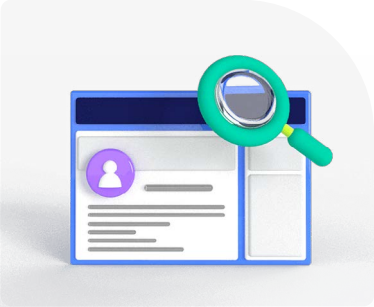
Verify skills mastery.

- Personalized project feedback and critique includes line-by-line code review from skilled practitioners with an average turnaround time of 1.1 hours.
- Project review cycle creates a feedback loop with multiple opportunities for improvement—until the concept is mastered.
- Project reviewers leverage industry best practices and provide pro tips.

Technical Mentor Support

24/7 support unblocks learning.

- Learning accelerates as skilled mentors identify areas of achievement and potential for growth.
- Unlimited access to mentors means help arrives when it's needed most.
- 2 hr or less average question response time assures that skills development stays on track.



Personal Career Services

Empower job-readiness.

- Access to a Github portfolio review that can give you an edge by highlighting your strengths, and demonstrating your value to employers.*
- Get help optimizing your LinkedIn and establishing your personal brand so your profile ranks higher in searches by recruiters and hiring managers.

Mentor Network

Highly vetted for effectiveness.

- Mentors must complete a 5-step hiring process to join Udacity's selective network.
- After passing an objective and situational assessment, mentors must demonstrate communication and behavioral fit for a mentorship role.
- Mentors work across more than 30 different industries and often complete a Nanodegree program themselves.

*Applies to select Nanodegree programs only.

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