Condisco Academy

Condisco–the Latin word for 'to learn thoroughly'

CRYPTO 101

Comprehensive course on blockchain for fintech professionals

TOTAL DURATION

~8 HOURS (38 MODULES)

This course consists of 38 lessons of about 15 minutes each and is a comprehensive, yet simple, overview of blockchain technology and its use in financial services. The course is suited for anyone with a solutions mindset and does not require any prior knowledge of blockchain. It is best completed sequentially.

Course overview

Lesson 1: The Basics

Duration: 9 minutes 42 seconds

The lesson introduces the foundational elements of blockchain technology. Concepts covered include

- centralized vs. distributed models of record keeping
- blockchain networks
- public vs. permissioned blockchains
- crypto tokens
- difference between recorded tokens and measured tokens

Lesson 2: Bitcoin Part 1

Duration: 11 minutes 12 seconds

Lessons 2 to 13 cover bitcoin. In the process of learning bitcoin, learners will be exposed to fundamentals of blockchain technology.

Concepts covered in lesson 2 include:

- four properties of cryptocurrencies: segregated accounts, account security, transferability and no double spending
- blockchain address and its role
- similarities and differences between a blockchain address and a bank account

Lesson 3: Bitcoin Part 2

Duration : 9 minutes 51 seconds

The lesson describes how account security works in bitcoin. Concepts covered include:

- definition of a payment message
- payment messages in banking vs. bitcoin payment messages
- the role of digital signatures in bitcoin payments

Lesson 4: Bitcoin Part 3

Duration: 17 minutes 6 seconds

The lesson continues to build on the account security discussion of the previous lesson. Concepts covered include:

- private key
- public key
- the mathematical relationship between blockchain address, private key and public key
- characteristics of bitcoin math: collision resistance, determinism, asymmetry
- intuition behind elliptical curve multiplication and hash functions

Lesson 5: Bitcoin Part 4

Duration: 15 minutes 13 seconds

The lesson continues to build on the account security discussion of lessons 3 and 4. Concepts covered include:

- digital signature generation
- digital signature verification
- the two bitcoin workflows: account opening and payments
- the role of mathematics in account opening
- the role of mathematics in payments
- wet signatures vs. digital signatures

Lesson 6: Bitcoin Part 5

Duration: 17 minutes 30 seconds

The lesson introduces crypto wallets. Concepts covered include:

- the role of the crypto wallet in the account opening and payments workflow
- the two functions of a crypto wallet- the UX function and the private key custody function
- cold storage
- hardware wallets
- seed phrase
- distinction between random and seeded wallets
- block explorers

Lesson 7 : Bitcoin Part 6

Duration: 17 minutes 4 seconds

The lesson explains how bitcoin is transferred from one account to another. Lesson 7 to Lesson 12 is focused on this topic. Concepts covered in this lesson include:

- viewing and analyzing an ethereum transaction on the bitcoin block explorer
- unspent transaction outputs
- comparative view of bitcoin payments vs. fiat money payments
- running a node vs. using a wallet

Lesson 8: Bitcoin Part 7

Duration: 12 minutes 38 seconds

The lesson builds on Lesson 7, describing how bitcoin is transferred from one account to another. Concepts covered include:

- custody of financial assets
- bearer and registered forms of custody
- how custody of crypto assets is exercised
- self-custody and its challenges
- custodial vs. non-custodial wallets
- the trade-off between decentralization and convenience
- blockchain and anonymity

Lesson 9: Bitcoin Part 8

Duration: 14 minutes 59 seconds

The lesson builds on Lessons 6,7 and 8, describing how bitcoin is transferred from one account to another. While the prior lessons covered the payment initiation phase, this lesson describes the authentication step. Concepts covered include:

- 3 components of authentication: AML, funds sufficiency and credential verification
- comparative view of authentication in fiat money vs. cryptocurrencies

Lesson 10: Bitcoin Part 9

Duration: 15 minutes

The lesson builds on Lessons 6, 7, 8 and 9, describing how bitcoin is transferred from one account to another. This lesson and next covers the steps that occur after a payment is authenticated. Concepts covered include:

- blocks and transaction confirmation
- mempool
- block creation time
- block size
- bitcoin mining and related concepts: block header, nonce, golden nonce, target, difficulty level

Lesson 11: Bitcoin Part 10

Duration: 22 minutes 27 seconds

The lesson builds on Lessons 6, 7, 8 ,9 and 10, describing how bitcoin is transferred from one account to another. This lesson, like lesson 10, covers the steps that occur after a payment is authenticated. Concepts covered include:

- block verification
- validators vs. miners
- the costs and rewards of validation
- the costs and rewards of mining
- the coinbase transaction
- transaction fees
- mining pools
- proof of work

Lesson 12: Bitcoin Part 11

Duration: 11 minutes 55 seconds

The lesson builds on Lessons 6, 7, 8 ,9, 10 and 11, describing how bitcoin is transferred from one account to another. This lesson, like lessons 10 and 11,

covers the steps that occur after a payment is authenticated. Concepts covered include:

- the chain of blocks
- block height
- the longest chain rule
- soft forks
- meaning of consensus in blockchain
- comparative view of value transfer in fiat money vs. cryptocurrencies

Lesson 13: Bitcoin Part 12

Duration: 11 minutes 16 seconds

The lesson describes how double spending is prevented and the circumstances in which bitcoin can be double spent. Concepts covered include:

- double spending through a soft fork
- double spending through a 51% attack

Lesson 14: Cryptocurrency and blockchain recap

Duration : 16 minutes 38 seconds

This is a recap lesson that covers the concepts explained in the prior 13 lessons. These concepts set the foundation for the learning for the remaining lessons in the course.

Lesson 15 : Ethereum Part 1

Duration : 10 minutes 36 seconds

Lessons 15 to Lesson 19 are devoted to Ethereum. For newcomers to blockchain, the topics covered hitherto in this course are essential for understanding Ethereum. The concepts covered in this lesson include:

- externally owned accounts vs. contract addresses
- smart contracts
- three types of transactions: payments, contract creation and contract triggering
- data versus value attribute
- difference between Ethereum and Bitcoin

Lesson 16: Ethereum Part 2

Duration: 10 minutes 33 seconds

Lesson 16 builds on the Ethereum concepts discussed in Lesson 15 through real life examples. The topics covered in this lesson include:

- viewing and analyzing an ethereum transaction on the etherscan block explorer
- viewing and analyzing a smart contract on etherscan block explorer
- the intuition behind the term *externally* owned account
- oracles

Lesson 17: Ethereum Part 3

Duration: 11 minutes 34 seconds

Lesson 17 to Lesson 19 identifies the ways in which Ethereum is different from Bitcoin and then describes those differences in detail. The topics covered in this lesson include:

- account opening and payments workflow in Ethereum
- gas
- transaction fees and gas
- Ethereum virtual machine

Lesson 18: Ethereum Part 4

Duration: 12 minutes 43 seconds

Lesson 18 builds on lesson 17 and continues to describe the ways in which Ethereum is different from Bitcoin. The concepts covered in this lesson include:

- blockchain states
- out of gas transactions
- new coin issuance
- uncle blocks

Lesson 19: Ethereum Part 5

Duration: 15 minutes 45 seconds

Lesson 19 builds on lessons 17 and 18, and continues to describe the ways in which Ethereum is different from Bitcoin. The concepts covered in this lesson include:

- staking and related concepts: block proposers, attestors, slashing, epochs and slots

- proof of stake vs. proof of work
- staking pools
- settlement finality in Bitcoin vs. Ethereum
- soft forks and fork choice in Ethereum

Lesson 20: Forks and Layer 2 solutions

Duration: 14 minutes 34 seconds

This lesson explains what forks and layer 2 solutions are. The concepts covered in this lesson include:

- altcoins
- hard forks vs. soft forks
- the scalability challenge
- layer 2 solutions
- explanation of Polygon layer 2 solution of Ethereum
- real life transaction on Polygon
- the blockchain trilemma as articulated by Vitalik Buterin

Lesson 21: Bitcoin Lightning Network Part 1

Duration: 15 minutes 57 seconds

While Lesson 20 covered an example of an Ethereum layer 2 solution (Polygon), this lesson and the next describes a Bitcoin layer 2 solution. This lesson explains what forks and layer 2 solutions are. The concepts covered in this lesson include:

- the intuition behind layer 2 solutions
- multi-signature bitcoin address
- payment channels

- funding vs. commitment transactions
- multi-hop payments
- routing fees
- trust challenges in the Lightning Network

Lesson 22: Bitcoin Lightning Network Part 2

Duration: 8 minutes 31 seconds

This lesson builds on the Lightning Network introduced in Lesson 21. The concepts covered in this lesson include:

- a real-life transaction on the bitcoin lightning network
- lightning invoices
- lightning addresses
- Polygon vs. Lightning Network: similarities and differences

Lesson 23: Intrinsic value of cryptocurrencies

Duration : 11 minutes 43 seconds

Lesson 2 to Lesson 22 describe how cryptocurrencies function. This lesson addresses the topic of their intrinsic value. The concepts covered include:

- intrinsic value of traditional money-gold standard vs. fiat money
- intrinsic value of cryptocurrencies

Lesson 24 : Non Currency crypto tokens Part 1

Duration : 9 minutes 05 seconds

Lesson 24 to Lesson 28 explain crypto tokens that are not cryptocurrencies. The concepts covered in this lesson include:

- four types of crypto tokens

- asset backed tokens
- stablecoins
- difference between stablecoins and native cryptocurrencies

Lesson 25: Non-Currency crypto tokens Part 2

Duration: 16 minutes 17 seconds

Lesson 25 builds on the theoretical overview of stablecoins presented in lesson 24 with a real-life example. The concepts covered include:

- introduction of tether
- real life tether transfer transaction
- overview of tether on etherscan block explorer
- the dual role of an externally owned account

Lesson 26: Non-Currency crypto tokens Part 3

Duration: 10 minutes 29 seconds

This lesson delves into ownership tokens. Concepts covered include:

- ERC 20 and other standards
- difference between ownership tokens and asset backed tokens
- proof of ownership via crypto token
- equity tokens
- the Ethereum crowdsale

Lesson 27: Non-Currency crypto tokens Part 4

Duration: 14 minutes 46 seconds

This lesson continues to build on ownership tokens introduced in Lesson 26. Concepts covered include:

- real life example of an NFT
- inter planetary file system
- NFT marketplaces
- the intrinsic value of NFTs
- ownership of real assets via NFTs

Lesson 28: Non-Currency crypto tokens Part 5

Duration: 1 minute 45 seconds

This lesson completes the overview of non-currency crypto tokens with a brief explanation of utility tokens.

Lesson 29: Decentralized Finance Uniswap Part 1

Duration: 18 minutes 46 seconds

Lessons 29 to Lesson 36 are focused on decentralized finance, which is explained through deep dives on two decentralized finance applications: Uniswap and Compound. Lessons 29 to Lesson 33 cover Uniswap. Concepts covered include:

- the meaning of decentralized finance
- centralized vs. decentralized exchanges
- order book vs. market making
- manual vs. automated market making
- liquidity pool
- the 2 roles: liquidity providers and traders
- slippage
- trading arbitrage and equilibrium

Lesson 30: Decentralized Finance Uniswap Part 2

Duration: 12 minutes 45 seconds

This lesson builds on the explanation of Uniswap in Lesson 29. Concepts covered include:

- pool tokens vs. deposited tokens
- impermanent loss
- trading fees

Lesson 31: Decentralized Finance Uniswap Part 3

Duration: 15 minutes 24 seconds

This lesson builds on the explanation of Uniswap in Lessons 29 and 30. While the earlier lessons focused on the core Uniswap concepts, this lesson describes the nuances of Uniswap version 3. The concepts covered include:

- infinite liquidity
- the problem of capital efficiency
- concentrated liquidity
- price ranges
- trading fees in version 3
- Uniswap NFT
- cross-price range swaps

Lesson 32: Decentralized Finance Uniswap Part 4

Duration: 14 minutes

Lessons 29 to 31 describe the theory behind Uniswap. This lesson is a real life demonstration of the Uniswap app. The concepts covered include:

- overview of the Uniswap app

- depositing a token on Uniswap
- processing a swap on Uniswap
- Uniswap pools

Lesson 33: Decentralized Finance Uniswap Part 5

Duration: 8 minutes 18 seconds

This lesson presents some final reflections on Uniswap. The concepts covered include:

- Recap of Uniswap
- Uni governance tokens
- Benefit of decentralized exchanges over centralized exchanges

Lesson 34: Decentralized Finance Compound Part 1

Duration: 14 minutes and 50 seconds

Lessons 34 to 36 cover another decentralized finance app called Compound. The concepts explained include:

- Introduction to Compound
- Making a loan
- Real life lending transaction
- Analyzing a lending transaction on Etherscan
- The C Token

Lesson 35: Decentralized Finance Compound Part 2

Duration: 13 minutes and 7 seconds

This lesson builds on the learning of the previous lesson. The concepts covered include:

- supply, borrow and pool utilization rates
- the interest rate model
- withdrawing a loan
- supplying collateral
- real life collateral provision on Compound app
- real life borrowing transaction on Compound app
- repayment of borrowing
- wrapped ether
- liquidation

Lesson 36: Decentralized Finance Compound Part 3

Duration: 6 minutes and 18 seconds

This lesson concludes the discussion on Compound with some final reflections. Concepts covered include:

- similarity and differences between Compound and Uniswap
- Compound as a money market fund

Lesson 37: Oracles

Duration: 14 minutes and 3 seconds

This lesson explains what Oracles are. Concepts covered include:

- determinism and smart contracts
- oracles
- decentralized oracle networks
- the oracle workflow

Lesson 38 : Finis

Duration: 4 minutes and 39 seconds

This is the concluding lesson of the course with reflections on:

- the learning path of the course
- the reason for using blockchain technology in financial services