

18D027

3 ECTS

Blockchain: From first principals to Analytics

Overview and Objectives

Blockchain is a disruptive foundation technology that enables complex use cases where a single source of truth is needed. It is part of the resulting technology stack in the transition from centralized computing, storage, and processing to decentralized architectures and systems.

First, this course will explore the technologies that make up the 'blockchain' technology, such as the (The Merkle Tree, Hashing, etc.) and how this technology comes together to solve many common problems in business today. We will explore cryptocurrencies (BTC, ETH, and Alt Coins) as the most successful example of Crypto Currency; but explain that blockchain is not limited to cryptocurrency.

Beside the payments use case, Blockchain technology opens manifold opportunities to redesign collaborative business processes such as supply chain and logistics processes. Real world example businesses will be spotlighted as examples, and industry experts will present on their blockchain experience, and business experience with the technology. Students will have a firm grasp on the far-reaching possibility of the technology, and be inspired to create their own new implementation.

Finally, the students will have a hands-on experience to create a blockchain application but also to see how blockchain interacts with Internet of Things and how it is seen from an analytics perspective.

Course Outline

Day 1: Discover Blockchain (2 hours)

Instructor: Jesse Seaver

What is the Blockchain, a history. (45 Minutes)

Before 'Blockchain' - the distributed Ledger.

Blockchain Defined: Satoshi Nakamoto White paper.

What technologies make up the blockchain, and how do they work. AV presentation on the fundamentals background behind the technology.

Core Blockchain Requirements (45 Minutes)

Review of the Shared Ledger, Smart Contracts, and Security (privacy and trust).

18D027

3 ECTS

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Exploration of the current major Cryptocurrencies and Tokens (30 Minutes)

How is BTC, ETH, XRP, and many other great examples of the blockchain, and why are they not the most important thing about the blockchain technology.

Day 2: Discover Blockchain Day 2 (2 hours)

Instructor: Jesse Seaver

Continued from Day 1:

Small selection of tutorial videos. Continued review of basic mechanics.

Type of Blockchains (Private vs Public)

Review of: Protocol and Consensus, Proof of Work Vs. Proof of Stake, Wallets, Scalability, Regulation, Overview of Ethereum, Overview of AltCoins. "On Chain and Off Chain" Legal Aspects (Regulation), Discussion.

(1 Hour, 45 Minutes)

Quiz on Days 1 and 2 (15 Minutes)

Day 3: Transforming and Funding Businesses (2 hours)

Instructor: Jesse Seaver

Guest Instructor: TBD

Review of Real World Blockchain Business Examples, and how ICO's and TGE's work.

(1 Hour)

Review of real world examples of blockchain based companies and how they are applying the technology today. Why is Blockchain relevant in most businesses.

Transform and fund an existing or new Business with Blockchain (1 Hour)

Exploration of a non-blockchain business(s), and how it could be 'blockchain based'.

Review of how Initial Coin Offerings and Token Generation Events work to fund new businesses. How could an existing business run an ICO and reinvent their business with blockchain?

18D027

3 ECTS

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Day 4: In the Real World: Blockchain Expert Presents (2 hours)

Guest Instructors: TDB

Two Experts Present on how they used Blockchain and what they built. A presentation from the perspective of someone who is already deep within the culture and what they have learned. What mistakes have they made? Where do they see the future of the technology going?

(2 Hours)

Day 5: Hands On Workshop Day 1: Hyperledger (3 hours)

Instructor: Gaston Besanson & Team

Hyperledger is an umbrella open project for blockchains with the support and development of many industry players, like IBM.

Introduction to Hyperledger Projects and tools.

Introduction to Hyperledger Fabric Architecture (transactions, chain codes, consensus)

Hands on exercises with Composer Playground

Material at:

<https://www.hyperledger.org/>

<https://hyperledger.github.io/composer/>

<https://github.com/hyperledger/composer-sample-applications>

Day 6: Hands On Workshop Day 2: Ethereum

Instructor: Gaston Besanson & TeamBlockchain can be a global computational infrastructure, which can run programs (second generation blockchain, like Ethereum): so-called smart contracts execute across the blockchain network and automatically enforce the conditions defined in the transactions to enable, for example, payment.

Introduction to Ethereum Architecture (EVM, Geth, Parity, Quorum)

Introduction to Smart Contracts with solidity

Hands on exercises with Truffle and Web3.js

18D027

3 ECTS

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Material at:

<https://www.ethereum.org/>

<http://solidity.readthedocs.io/en/latest/>

Book: Chris Dannen, Introducing Ethereum and Solidity: Foundations of Cryptocurrency and Blockchain Programming for Beginners, Apress, 2017.

Day 7: Hands On Workshop Day 3: Blockchain & IoT & Analytics (3 hours)

Instructor: Gaston Besanson & Team

Blockchain can be mashed with other technologies like Internet of Things, which allows new dynamics to the blockchain uses cases, bringing user stories supported by mobile apps, machine to machine communications, among others. From an analytics perspective, blockchain is another data structure, which combined with traditional data sources, one can create hybrid use cases.

Introduction to off-chain services (Swarm, IPFS) and Oracles. Build an Ethereum Dapp that interacts with an IoT device using Web3.js

Create a graph analysis from a data set of blockchain transactions and obtain insights

Day 8: Student Presentations & Wrap Up Blockchain Frontiers (3 hours)

Instructor: Jesse Seaver & Gaston Besanson

As a group, Students will present a blockchain use case, taking advantage of the components developed in the workshops. A week later, the students will do a final delivery of the presentation and code.

Frontiers Discussion: A wrap up day to explore some expert opinion and thoughts on the future of Blockchain. A mix of accumulated videos, white paper reviews.

Future: How far are we from the tokenization of the enterprise?

Evaluation

The course will be graded using quizzes and a final project.

18D027

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3 ECTS

Instructors:

Jesse Seaver has been writing about blockchain technology since 2013, when one bitcoin was worth just \$22. He is the author of HuffPost's blog series "Blockchain: Reinventing Business" which is routinely a top match for searches on a variety of blockchain topics. He is currently at work on a book tentatively titled Blockchain: Reinventing Your World.

Gaston Besanson has been involved with the technical and quantitative sides of blockchain economics, from an empirical research and outreach point of view. He is a data scientist with focus in AI and Blockchain.