האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

Blockchain and Cryptocurrencies - 55669

Last update 16-02-2020

HU Credits: *1*

Degree/Cycle: *2nd degree (Master)*

Responsible Department: *Business Administration*

Academic year: *0*

Semester: *2nd Semester*

Teaching Languages: *English*

Campus: *Mt. Scopus*

Course/Module Coordinator: *Lipton Alexander*

Coordinator Email: *fintech@mail.huji.ac.il*

Coordinator Office Hours:

Teaching Staff:

Course/Module description:

Summary

This course provides an introduction to distributed ledger technology, blockchains and cryptocurrencies, and their potential applications in finance and banking.

Content

The course covers the basics of cryptography and its applications to cryptocurrencies; historical examples to centralized cryptocurrencies; foundations of modern decentralized cryptocurrencies; Byzantine fault tolerant consensus; mechanics of Bitcoin platform including storage, mining, wallets, etc.; alternative platforms, including Ethereum; smart contracts; potential applications of decentralized ledgers in finance and their pros and cons.

Keywords

Electronic Money, Cryptocurrencies, Distributed Ledger Technology, Blockchain, Bitcoin, Ethereum, Smart Contracts

Learning Prerequisites

Recommended courses

Introduction to Finance

Important concepts to start the course

Cryptography, Databases, Payment Systems

Course/Module aims:

Learning outcomes - On successful completion of this module, students should be able to:

- *Use basic cryptographic concepts including private/public keys, signatures, hash functions, Merkle trees*
- *Distinguish pros and cons of centralized versus decentralized databases*
- *Demonstrate several historical examples of electronic money*
- *Quantify alternative approaches to Byzantine fault-tolerant consensus including proof of work, proof of stake, etc.*
- *Characterize the basic setup of Bitcoin, including storage, mining, and payments*
- *Implement the best practices in key management, including multi-signature schemes and multi-layer wallets*
- *Argue the limits of privacy with distributed ledgers and possible solutions, such as channeling, coin-joining, confidential transactions and zero-knowledge proofs*
- *Analyze some of the potential applications of distributed ledger technology to finance and banking*
- *Elaborate inherent scalability limits of distributed ledgers and potential solutions with channeling, horizontal scaling and second-layer, off-chain transactions*

• *Implement some basic operations with Bitcoin*
• *Assess / Evaluate differences and commonalities between Bitcoin and Ethereum*
• *Implement basic smart contracts*

Attendance requirements(%):

Teaching arrangement and method of instruction: Lectures, exercises, homework

Course/Module Content:

1. Course Introduction
2. History
3. Overview of blockchain technology
4. Hashes
5. Transactions
6. Blocks and blockchain
7. Consensus building
8. Mining and incentivizing blockchain
9. Security and safeguards
10. Bitcoin
11. Blockchain applications
12. Blockchain applications (cont.)
13. Final Project

Required Reading:

Narayanan, A., Bonneau, J., Felten, E., Miller, A. and Goldfeder, S., 2016, Bitcoin and Cryptocurrency
Technologies, Princeton University Press.
2018-2019 COURSE BOOKLET

Additional Reading Material:

Grading Scheme:

Additional information: