BLOCKCHAIN TECHNOLOGIES AND CRYPTOCURRENCIES (AP1050)

--COURSE SYLLABUS--

Bitcoin is a particular implementation of Blockchain technology that has led to a disruptive “product”: a set of digital cryptocurrencies with the potential to compete with fiat currencies. This course will provide students with the concepts and mechanics of the Blockchain technologies starting from Bitcoin. Unlike ECE1770, this course is not focused on middleware software design per se, but on how the Blockchain middleware can serve as a platform that supports products (cryptocurrencies) and applications that are relevant for businesses and other users. The course will focus on identifying business relevant benchmarking criteria for Blockchain technologies in accordance with their current and future impact on business processes. On a practical level, the course will enable students to set up a Bitcoin account that follows rigorous safety protocols, so as to enable students to become familiar with this revolutionary technology.

This course will enable students to:

1. Acquire a concrete understanding of Blockchain technologies through the installation, operation and modification (by coding changes or the addition of pseudocode) of a simplified Blockchain program in each student’s computer.
2. Become acquainted with the history and typology of Blockchain technologies: the landscape of cryptocurrencies and hyper currencies
3. Develop and apply a set of selection criteria for the evaluation of Blockchain strengths, weaknesses and risks with respect to: networked integrity, distributed power, value as incentive, security, privacy, rights preserved and inclusion
4. Trace a likely path for the adoption of Blockchain technologies-- beginning with the identification of processes where Blockchain ledgers lead to efficiencies, to the emergence of new business models and ending with the need for constraints/regulation.
5. Learn to setup, operate and trade a Bitcoin account safely.

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CORE READING LIST

   https://openlibrary.org/works/OL17802119W/Understanding_Bitcoin
   http://bitcoinbook.cs.princeton.edu/
3. Dan Tapscott et. Al (2016) Blockchain Revolution, Penguin. ($14 at Amazon) This one is ESSENTIAL.

There are no mandatory prerequisites but previous course work or experience in programming would be helpful.

Course Structure and Content

Cryptocurrencies and other Blockchain Technologies is divided into four themes and 12 modules:

- The first theme: Economics of Cryptocurrencies
- The second theme: Bitcoin Technology
The third theme: Blockchain Disintermediation & New Business Models
The fourth theme: Owning and Trading Bitcoin

Learning outcomes

1. An annotated blueprint of current Blockchain designs with special attention to Bitcoin and Ethereum and their technical features
2. A benchmarking of Blockchain models (cryptocurrencies and hypercurrencies) with respect to selection criteria relevant to business activity
3. A possible path for the adoption of Blockchain, the emergence of new business segments and of decentralized technology communities and organizations
4. A working Bitcoin account as a learning tool.
PART ONE: INTRODUCTION AND ECONOMICS

Session 1 [3.42]

Foundational Themes: the 4 meanings of Bitcoin, Significance of Bitcoin as a Currency, 4 converging views of Bitcoin, Significance of Bitcoin as a Technology (Blockchain), Challenges, Possible outcomes

Readings & homework: Franco (2015) 1, 2 & 3
How Blockchain Will Change Organizations Don Tapscott Alex Tapscott 2017
The Truth About Blockchain Marco IansitiKarim R. Lakhani 2018

PART TWO: BITCOIN TECHNOLOGY

Session 2 [3.16]


Readings & homework:
Franco (2015) 5 & 7
Homework 1 due (see list below)

DEMO: SMALL PYTHON BLOCKCHAIN INSTALL & RUN

Session 3 [2.58]

Bitcoin Wallets & Exchanges

Readings & homework:
Franco (2015) 8
15 minute Quiz on class 2 contents
WALLET DEMO: Cryptocurrency Account Setup: A System for Owning Cryptocurrencies: Tails, Electrum & Bitcoin Core, Testnet

Session 4 [3.02]


Readings & homework:
Franco (2015) 4, 6, 12
The Bitcoin Lightning Network: Scalable Off-Chain Instant Payments
A Fast and Scalable Payment Network with Bitcoin Duplex Micropayment Channels
Homework 2 due (installation and running only, see list below)

Session 5 [3.20]

Privacy: Loss of Privacy via Transaction Analysis & Side Channel Analysis, Mixing, The Bitcoin Privacy Model, Cryptographic Alt-Coins (Monero, Zcash)

Readings & homework:
Franco (2015) 13
Homework 2 due (results, see list below)

Session 6 [1.02]
PART THREE: BLOCKCHAIN

Session 7 [4.13]
Blockchain: Changing Bitcoin (Block Size, Puzzle, Consensus), Alternative Protocols for Distributed Consensus (Practical Byzantine Fault Tolerance, Proof-of-Stake), Distributed Ledger Technologies, Use Cases of DLTs

Readings & homework:
Nussbaum, Blockchain Project Ecosystem Market Map and Musings on the State of the Ecosystem, (2017)

Session 8 [4.04]
Ethereum, Ethereum Dapps, The DAO, The SEC: Token vs. Coins vs. Stocks

Readings & homework:
Franco (2015) 12.7.3
Overview of Ethereum: White Paper
Homework 4 due (see list below)

Session 9 [1.29]
Altoins: Stability and Interoperability

Readings & homework:
Franco (2015) 14
Dan Tapscott et. al (2016) 1, 2, 3, 4
Driscoll, Surveying Blockchain Tech For Enterprise (2017)
Homework 5 due (see list below)

PART FOUR: OWNING AND TRADING BITCOIN

Sessions 10
Trading: Trading Cryptocurrency Pairs using Statistical Arbitrage: A Python program for trading crypto currency pairs will be provided and explained.


Readings & homework:

Corbet, Shaen and Lucey, Brian M. and Yarovaya, Larisa, Datestamping the Bitcoin and Ethereum Bubbles (December
Sessions 11 & 12

Presentations by Students

Readings & homework:

Dan Tapscott et. al (2016) 5 & 6
Driscoll, Surveying Blockchain Tech ForEnterprise (2017)

Homework 7 due (Session 11)
Presentations due (Session 11)
Presentations due (Session 12)

Individual Papers due on ‘final exams week’

Course Grading (1 Session per Week):

The components of the final course grade will be weighted as follows. Student evaluation will be based on the following criteria:

Session 3: Quiz.................................................................................................................................5%
Team Homeworks (all software to be provided to students).........................................................70%

1. Homework 1 due on Session 2: Installation, successful use and description of results of digital signature &
   asymmetric encryption software
2. Homework 2 due on Sessions 4 & 5: Installation, running, description of results and optional modification of a
   Blockchain program
3. Homework 3 due on Session 6: Installation, successful use of Tails, Electrum testnet Bitcoin wallet, Bitcoin
   Core & Bitcoin blockchain browser
4. Homework 4 due on Session 8: Installation & description of results under stipulated conditions of a program
   that solves the Byzantine General’s Problem
5. Homework 5 due on Session 9: Installation, successful use of testnet Ethernet wallet Metamask & Ethernet
   blockchain browser
6. Homework 6 due on Session 10: Writing (by copy and paste), publication and description of results of faucet
   smart contract on Ethereum blockchain
7. Homework 7 due on Session 11: Evaluation of possible status (Token vs. Coin vs. Stock) of a short list of
   cryptocurrencies

Sessions 11 & 12: Team Presentation on a blockchain use case/case study/crypto valuation

method................................................................................................................................................15%

Final Exams Week: Individual final paper on the aspect of the team presentation developed by each
student...............................................................................................................................................10%

Note: these statements are guidelines subject to change.

Textbooks:

   https://openlibrary.org/works/OL17802119W/Understanding_Bitcoin
3. Dan Tapscott et. Al (2016) Blockchain Revolution, Penguin. ($14 at Amazon) This one is ESSENTIAL.

Cases (to be presented by students):

2. CASE STUDY PRESENTATION: Deutsche Bank: Pursuing Blockchain Opportunities (A) and (B) by Lynda M. Applegate, Roman Beck and Christoph Müller-Bloch 2017, Harvard Business School Case, https://www.hbs.edu/faculty/Pages/item.aspx?num=52628

Articles (to further contextualize the cases to be presented):

11. Letter of support for A.B. 1326 (CoinCenter),


