

Introduction to Blockchain

INF 385T (27744) – Fall 2018

Friday 12pm-3pm

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Course Overview

This class will provide an overview of the concept, technology, and impacts of blockchain. Distributed ledger technologies (DLT), including blockchains, have become an enormous field of interest since the introduction of Bitcoin, the world's first operational blockchain, in 2009. Since then, blockchains have been described as everything from a game changer for society to overblown hype to a financial bubble. As with most technological innovations, the truth probably lies somewhere in between. To understand what blockchains may mean for us, we must explore them from different perspectives and levels of analysis, not just the focus on engineering that often dominates today's blockchain discussions.

The course will be multi-level, multidisciplinary, and critical, with a focus towards giving students a basic understanding of how blockchains work, where they are used, their limitations, and how they affect organizations and society now and in the future. There is a lot of hype and ambiguity about blockchain. Our objective is to cut through some of this confusion and help students understand what blockchains are really about so that they can make informed analyses and decisions regarding its use.

Audience and Objectives

This course is intended to be multidisciplinary and accessible to students from different backgrounds. A primary objective of the course is to enable and encourage students from any discipline to understand and imagine ways they may engage with blockchain technologies in the context of their existing skills and knowledge. To that end:

- This course will not focus on teaching blockchain engineering and programming, although these will be discussed in detail
- This course does **not** require a technical background but will include technical labs and exercises, so less technically proficient students should be open to exploring new skills

- The same holds true for those students who are highly technical - be ready to dive into issues of business, compliance, sociology, and philosophy
- This course will think critically about blockchain as a topic, which means we will not simply accept claims and promises, positive or negative, without evidence and analysis.

Content Design

This course is divided into four modules (along with course introductions and conclusions), each building on the previous, with the objective of teaching students to understand and engage with blockchain technologies at multiple levels:

1. **Technology and Functionality**
2. **Applications and Use Cases**
3. **Challenges and Constraints**
4. **Philosophy and Implications**

Educational content for the course will include readings, online materials and references, lectures and discussions, as well as guest lecturers and speakers based upon their availability.

Course Introduction: Blockchain's History and Basic Concepts

Although Satoshi Nakamoto's Bitcoin white paper can be said to mark the formal beginning of blockchain, the technology was not "invented" so much as "innovated" from previous technologies in a novel way. We will discuss this history and explore how blockchain evolved from the dreams and aspirations of early digital innovators, cryptoanarchists, and cypherpunks into a functional digital currency with an underlying technology that may or may not prove transformational for our society.

Blockchain Technology

In this module we will explore the basics of how blockchains work "under the hood" at the technical level. This includes questions of definition and terminology, different types of blockchains, and details of how they function. Specific topics may include:

- Cryptography
- Networking
- Consensus mechanisms
- Coins and tokens
- Smart contracts
- Distributed applications (dAPPS)
- Decentralized autonomous organizations (DAOs)

Blockchain Applications and Use Cases

Everywhere you look, people are claiming that blockchain technologies will revolutionize processes and industries. In this module we will look at how blockchain is being put to use today, and how people are thinking about using it tomorrow. Specific topics may include:

- Business drivers of blockchain
- Digital currency and finance (including ICOs and alternative funding)
- Identity
- Supply Chain
- Healthcare
- Ownership and property rights
- Governance and compliance

Blockchain Challenges and Constraints

Despite their promise, blockchain technologies face a number of critical hurdles and limits. In this module we will look at how the blockchain hype collides with reality. Specific topics may include:

- Blockchain risks
- Technological challenges
- Standards (or lack thereof)
- Scalability issues
- Security and privacy
- Legal and regulatory problems
- Social and cultural constraints

Blockchain Philosophy and Implications

Blockchain is not just a technology, but in many cases an embodiment of philosophical and political values. In this module we will look at how blockchain and the cultures growing around it reflect various philosophical perspectives on society, capitalism, and technology. Specific topics may include:

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- Philosophical underpinnings of blockchain (cryptoanarchy revisited)
- Centralization vs. decentralized systems
- Open vs. closed systems
- Will blockchain change the way we think or live?
- Technology hype vs. reality
- Similarities with the development of networking & the Internet
- Corporate adoption and co-opting of blockchain tech

Course Conclusion: Reflections on Present and Future

To close out the course, we will explore where blockchain technology may go and where it might take those who build, manage, and adopt it. On a more personal level, students will examine what they have learned over the semester and create their own path forward, personally and/or professionally, for applying their newfound knowledge and skills.

Assignments and Class Participation

Assignments will include the following:

- Assigned readings
- Quiz
- Two case studies (1500-1750 words each)
- One reflection/professional paper (1500-1750 words)
- Labs and practical exercises, with write-ups (250-500 words each)

Specific assignments will be discussed the first day of class and throughout the semester.

Attendance and active class participation are mandatory. Given that the class only meets once a week, it is critical that you attend each scheduled class session. If you must miss a class you must let me know well ahead of time and arrange with one of your colleagues to take notes for you or cover any assignments due. Unexcused absences will incur a penalty of 5% of your final grade (cumulative, per absence).

Grading

Grading will be based on the following matrix:

- Participation and Readings - 20%
- Quiz - 15%
- Case studies - 30% (15% each)
- Reflection paper - 20%
- Labs/Exercises - 15%

Per University policy, the grading scale for this class is A, A-, B+, B, B-, C+, C, C-, D+, D, D-, and F.

Required Texts

Blockchain technology is interesting. It is so new that there are few comprehensive textbooks, and yet the technology has received so much attention that there are hundreds of books and other resources available about it. Because of this, there will be no required textbooks for this course, but several textbooks will be suggested. The required readings will be available online or through Canvas.

Policy on Scholastic Dishonesty

Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced. For further information please view the University catalog:

<http://catalog.utexas.edu/general-information/the-university/#universitycodeofconduct>

Students with Disabilities

Students with disabilities may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 471-6259.

Calendar:

| <u>Class</u> | <u>Topics Covered & Activities</u> | <u>Activities, Readings, & Assignments</u> |
|--------------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 - 8/31 | Course Introduction Readings & Assignments | <ul style="list-style-type: none"> • Review <i>Course Syllabus</i> • Introduce everyone • Discuss class goals |
| 2 - 9/7 | Origins & Basic Concepts | <ul style="list-style-type: none"> • Lecture - <i>Origins & Concepts</i> • Discuss <i>9/7 Readings</i> (see Canvas) • Assign: Lab 0 (Canvas/Github) |
| 3 - 9/14 | Technology | <ul style="list-style-type: none"> • Lecture - <i>Blockchain Overview</i> • Discuss <i>9/14 Readings</i> (see Canvas) • Demo / Guest • Assign: Lab 1 (Canvas) |
| 4 - 9/21 | Technology | <ul style="list-style-type: none"> • Lecture - <i>Blockchain Specifics</i> • Discuss <i>9/21 Readings</i> (see Canvas) • Demo / Guest • Assign: Quiz (Canvas) • Assign: Lab 2 (Canvas) • Due: Lab 1 write-up |
| 5 - 9/28 | Applications & Use Cases | <ul style="list-style-type: none"> • Lecture - <i>General Blockchain Uses</i> • Discuss <i>9/28 Readings</i> (see Canvas) • Demo / Guest • Assign: Case Study 1 (Canvas) • Due: Quiz • Due: Lab 2 write-up |
| 6 - 10/5 | Applications & Use Cases | <ul style="list-style-type: none"> • Lecture - <i>Specific Blockchain Uses & Blockchain for Business</i> • Discuss <i>10/5 Readings</i> (see Canvas) • Demo / Guest • Assign: Prep Pilot Design Lab |
| 7 - 10/12 | Applications & Use Cases | <ul style="list-style-type: none"> • Blockchain Pilot Design Lab (in-class workshop) |
| 8 - 10/19 | Flex Day - Activities TBD | <ul style="list-style-type: none"> • Due: Case Study 1 |
| 9 - 10/26 | Challenges & Constraints | <ul style="list-style-type: none"> • Lecture - <i>Technical Challenges</i> • Discuss <i>10/26 Readings</i> (see Canvas) • Demo / Guest • Assign: Case Study 2 (Canvas) |
| 10 - 11/2 | Challenges & Constraints | <ul style="list-style-type: none"> • Lecture - <i>Social, Legal & Governance Challenges</i> |

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| | | <ul style="list-style-type: none"> • Discuss <i>11/2 Readings</i> (see Canvas) • Demo / Guest |
| 11 - 11/9 | Blockchain Informatics | <ul style="list-style-type: none"> • Lecture - <i>Social Informatics and Blockchain Technologies</i> • Discuss <i>11/9 Readings</i> (see Canvas) • Demo / Guest • Assign: Reflection Paper (Canvas) • Case Study 2 due |
| 12 - 11/16 | Philosophy & Implications | <ul style="list-style-type: none"> • Lecture - <i>The Philosophical Blockchain</i> • Discuss <i>11/16 Readings</i> (see Canvas) • Demo / Guest |
| 13 - 11/23 | <i>Thanksgiving Holiday</i> | |
| 14 - 11/30 | Reflecting on Blockchain's Past, Present, & Future | <ul style="list-style-type: none"> • Discussion - <i>Bringing Things Together</i> • Discuss <i>11/30 Readings</i> (see Canvas) • Student-led reflections • Due: Reflection Paper |
| 15 - 12/7 | Course Conclusion | <ul style="list-style-type: none"> • Student feedback • Open discussion • Fond goodbyes! |