Introduction to Blockchain

INF 350E (27370) / INF 385T (27555) – Spring 2019
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,
cryptolibertarians, 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:

- 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
- Reflective mini-essays (RME’s) (250-500 words each)
- Quiz
- Labs and practical exercises (250-500 word writeups)
- Design projects with presentations
- Final project/paper (case study or professional plan) (2000-2500 words)

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 (percentage indicates total weight):

- Participation and Readings - 25%
- Reflective mini-essays (RMEs) (4) - 20%
- Quiz - 10%
- Labs/exercises (4) - 20%
- Design projects (2) - 15%
- Long paper (case study or professional plan) - 10%

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, although several texts 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
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.

Course Calendar:

<table>
<thead>
<tr>
<th>Class</th>
<th>Topics Covered &amp; Activities</th>
<th>Activities, Readings, &amp; Assignments</th>
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</table>
| 1 - 1/25 | Course Introduction  
Readings & Assignments | ● Review Course Syllabus  
● Introduce everyone  
● Discuss class goals |
| 2 - 2/1 | Origins & Basic Concepts  
              | ● Lecture - Origins & Concepts  
       ● Discuss 2/1 Readings |
| 3 - 2/8 | Technology  
              | ● Lecture - Blockchain Overview  
       ● Discuss 2/8 Readings  
       ● Demo / Guest  
       ● Due: RME 1 |
| 4 - 2/15 | Technology  
              | ● Lecture - Blockchain Specifics  
       ● Discuss 2/15 Readings  
       ● Demo / Guest  
       ● Due: Lab 1 write-up |
| 5 - 2/22 | Applications & Use Cases  
              | ● Lecture - General Blockchain Uses  
       ● Discuss 2/22 Readings  
       ● Demo / Guest  
       ● Due: Quiz  
       ● Due: Lab 2 write-up |
| 6 - 3/1 | Applications & Use Cases  
              | ● Lecture - Specific Blockchain Uses  
       ● Discuss 3/1 Readings  
       ● Demo / Guest  
       ● Due: Lab 3 write-up  
       ● Due: RME 2 |
| 7 - 3/8 | Design Lab  
              | ● Blockchain Pilot Design Lab 1  
       (in-class workshop)  
       ● Due: Lab 4 write-up |
| 8 - 3/15 | Design Lab Presentations  
              | ● Due: Design Lab 1 Presentations |
| 9 - 3/22 | SPRING BREAK |
| 10 - 3/29 | Challenges & Constraints  
              | ● Lecture - Technical Challenges  
       ● Discuss 3/29 Readings |

Introduction to Blockchain; INF 350E/385T; Spring 2019 – Subject to revision
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<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>11 - 4/5</td>
<td>Challenges &amp; Constraints</td>
<td>Lecture - Social, Legal &amp; Governance Challenges</td>
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<td>Discuss 4/5 Readings</td>
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<td>Demo / Guest</td>
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<td>12 - 4/12</td>
<td>Design Lab</td>
<td>Blockchain Pilot Design Lab 2</td>
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<td>(in-class workshop)</td>
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<td>13 - 4/19</td>
<td>Design Lab Presentations</td>
<td>Due: Design Lab 2 Presentations</td>
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<td>14 - 4/26</td>
<td>Philosophy of Blockchain</td>
<td>Discussion - Philosophers of Blockchain</td>
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<td>Discuss 4/26 Readings</td>
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<td>Demo / Guest</td>
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<td>Due: RME 4</td>
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<td>15 - 5/3</td>
<td>Blockchain’s Past, Present, &amp; Future</td>
<td>Discussion - Bringing Everything Together</td>
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<td>Discuss 5/3 Readings</td>
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<td>Student-led reflections</td>
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<td>Due: Final Project</td>
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<td>16 - 5/10</td>
<td>It’s Over!</td>
<td>Student feedback</td>
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<td>Movie and snacks</td>
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<td>Fond goodbyes!</td>
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