COSC Spring 2021 - 4010 or 5010 Special Topics - Blockchian

UNIVERSITY OF WYOMING

COSC 4010 or 5010

Blockchain Design and Programing

Online with scheduled discussion groups

Spring 2021

Instructor contact information:

Email: pschlump@uwyo.edu

Phone: (for emergencies) 720-209-7888 - before you call you need to SMS me with who you are and what class you are in so that I add you to my address book. I get far too many robo-calls to answer unknown phone numbers. Generally I am available from 7AM to 10PM.

Office hours:

I will hold office hours from 8:00AM to 9:00AM on Monday, Wednesday and Friday or by appointment. Office hours are on zoom - I will send out a link via email.

Required texts

Textbook: We have a textbook for the 2nd $\frac{1}{2}$ of the class on Ethereum/Solidity. Solidity has moved from version 5.12 to 5.17 in the past 3 months. The text book for Go is a free online PDF: https://www.golang-book.com/books/intro We will also be using IOHK's BlockChian. It is programmed in Haskell.

This means that you will need to program in Go, Solidity, Haskell in a single semester. We will have some focus on how to learn a new language and become effective in that language.

General requirements and expectations for the course

You must demonstrate working homework to the instructor or to the class grader to pass the class (no matter how many points you get). For code developed in Go, test cases will be supplied. The Go homework are cumulative. Assignment 3 depends on getting a working version of 2 etc.

The class will have lectures - pre-record, discussion groups that have attendance taken - you are required to attend the discussion - they will be at 3 different times of the day. The topic is the same at each time so just attend one time. There are 5 of these.

Required examinations and assignments

There will be 9 programming assignments over the course of the semester, as well as one midterm and a final exam. Tests will be 800 points. 400 for the midterm, 400 for the final. 1,400 points are from the homework and paper, 100 to 200 points per assignment.

Final / Midterm Examination

Midterm will be a short answer and multiple choice online from a test bank.

Final will be online - probably a writing assignment.

Grading Scale:

Letter Grade	Points
A	1,800 points or above
B	1,600-1,799 points
C	1,400-1,599 points
D	1,200-1,399 points

Extra credit

None planned at this time.

Late work.

Work turned in late will loose 10% per calendar day, down to 40% of the original grade. Nothing may be turned in after the last day of class.

Class Overview

1. What is Blockchain / Bitcoin and Why it is Important. In 2009 a person or group of people named Satoshi Nakamoto published "Bitcoin: A Peer-to-Peer Electronic Cash System" . The Bitcoin design was revolutionary — it elegantly tied cryptography, game theory, and economics into a trust-less solution to the double-spend problem, and introduced the world to the first "chain of blocks," a censorship-resistant public ledger protected by proof-of-work. This is a big deal. Unlike traditional payments, Bitcoin transactions don't rely on a trusted third-party. Anyone can connect to the network and transact, without fear of censorship. Satoshi's work solved these problems, and founded the field of cryptoeconomics. In 2013, Vitalik Buterin proposed a new cryptocurrency —Ethereum. Ethereum was Vitalik's answer to Bitcoin's poor scripting capabilities. Instead of focusing on financial transactions and their outputs, Ethereum transactions are about state: agreeing on a computed state, and transitioning from one state to the next. Each transaction in Ethereum includes a sender, recipient, funds, and data, similar enough to Bitcoin. Unlike Bitcoin, however, a recipient can be a user or a smart contract.

2. Gartner group projects that 3% of the world economy will be BlockChain based in 10 years. This is a compounded annual growth rate of 62.2%.

3. The Plan - Do lectures in advance of when assignments are due on the material and give students time to do homework. Mark what is going to be tested on.

4. This class is not a "heavy" programming class. Yes, you will program but not a huge amount. Unlike a lot of computer science classes this class has a paper and will have test questions involving definitions. We are going to cover some finance, accounting, economics and other topics and not just "how to build a better program." If you have a limited programming background I will work with you.

The 5 Interactive discussions.

These are required. They will be on zoom. Choose a time of day to attend. They will be held at 3 different times a day - so you only need to attend one of the 3 on that a day. Each of the synchronous zoom discussions will be at 9:00am, 4:00pm and 6:00pm on a Wednesday. If you are unable to make one of the times let me know and I will find a time. These will be about 45 minutes long.

1. Blockchain and Cryptocurrencies - Feb 3
2. Blockchain in Supply Chain - Feb 17
3. Real Security / Personal Security - Feb 24
4. Backup and the Law - Mar 10
5. Future of Blockchain - Mar 17

This is an approximate schedule. Updates will be noted in class.

Date	Week No	Topics
Jan 21, 2021	1	Introduction to class
		Cover Syllabus - Syllabus revisions - Office Hours - Class Policy
		My background, an introduction to Go, Solidity and Contracts.
Jan 21, 2021	1	What is a Blockchain. Why Go, Overview of the BlockChain.
		What makes BlockChain special and useful?
		Computer trends. What the future portends.
		How applications work today - web3 applications.
Jan 25, 2021	2	What is a hash, What are hashes used for, Types of hashes.
Jan 25, 2021	2	Mining walk through.
Jan 25, 2021	2	Merkle Trees, Proof of work, Proof of stake. IOHK Ouroboros Protocol.
Feb 01, 2021	3	Economics of BlockChain. Cheat Grass, Co2, Land Titles.
Feb 01, 2021	3	More on Go complicated stuff; Map synchronization, Go core/panic.
		Go interfaces, Go weaknesses.
		Assinment 1 Due - Go Hello World and 9 other chunks. 100pts.
Feb 01, 2021	3	Finance: Creating personal wealth, Purposes of a business, Terms and
		definitions.
Feb 07, 2021	4	Transactions / Data Storage
Feb 07, 2021	4	Public Private Keys
Feb 07, 2021	4	ECDSA & RSA encryption, Quantum Computers and NTRU.
		Assinment 2 Due - Mining(hashes) / Merkle Trees (very simple Merkle)
Feb 14, 2021	5	Digital Security.
Feb 14, 2021	5	Blockchain Economics; Blockchain in non-profs, Proof of trust,

Date	Week No	Topics
		Tracking of donations, Software economics, Normal technology cycles, SQL
		crash, .com crash.
Feb 14, 2021	5	Smart Contracts, Solidity(Ethereum), Haskell(IOHK)
Feb 21, 2021	6	Standard Contracts, Simple tokens, Standard tokens, ERC-20, ERC-721,
		ERC-1203.
		Assinment 3 Due - Client Server and Transactions.
Feb 21, 2021	6	Finance and Terms, Accounting(history)- Double Entry Book keeping,
		Cooking the books.
Feb 21, 2021	6	Wallets, Analogy for what BlockChain is, Client-Server how to implement
Feb 28, 2021		Midterm Exam
Feb 28, 2021	7	Standard contracts, Go and Ethereum, ERC-20, Events, interoperability.
Feb 28, 2021	7	Client/Servers
Feb 28, 2021	7	Client/Servers part 2.
		Assinment 4 Due - Wallet.
Mar 01, 2021	8	Installing NPM and Node, Why use Ethereum, Eth and Gas, Truffle
		development system.
Mar 01, 2021	8	Smart Contracts in detail.
Mar 01, 2021	8	What are dApp and web3, Interoperability between chains.
		Assinment 5 Due - Signed Data - with client server.
Mar 07, 2021	9	Patterns and How to Learn New Languages: Solidity.

Date	Week No	Topics
Mar 07, 2021	9	More on ERC-20 and ERC-721 and ERC-1203
Mar 07, 2021	9	Creating wealth, Jobs in BlockChain, Blockchain economics.
		Assinment 6 Due - Metadata contract - signed documents.
Mar 14, 2021	10	Concurrency in Go, Go routines, Locks, Channels
Mar 14, 2021	10	How ECDSA works, the Basics of public key security.
Mar 14, 2021	10	Functional programming and contracts (Beginning of IOHK stuff)
		Assinment 7 Due - Test-Net ERC-20/ERC-721 based contract.
Mar 21, 2021	11	Insurance companies and Non fungible Tokens
Mar 21, 2021	11	Testing and Test Output
Mar 21, 2021	11	Automatic Verification of Code and Contracts
		Assinment 8 Due - Familiarize with IOHK/Marlow.
Mar 28, 2021	12	Tokens; Simple and Standard
Mar 28, 2021	12	Zero Knowledge Proofs, Digital Security, zk-SNAKRS, Byzantine Generals
		problem and the Honey-Badger solution.
Mar 28, 2021	12	IOHK's system. Nix-OS and Contracts.
		Assinment 9 Due - IOHK/Marlow based state machine contract.
Apr 05, 2021	13	Legal Ramifications of BlockChain, ICOs 506(d), Subpart (s)
Apr 05, 2021	13	Personal Security Friction vs Access.
Apr 05, 2021	13	More on Security and Encryption
Apr 12, 2021	14	Final Review

Title IX – Duty to Report

The University of Wyoming faculty are committed to helping create a safe learning environment for all students and for the university as a whole. If you have experienced any form of gender or sex-based discrimination or harassment, including sexual assault, sexual harassment, relationship violence, or stalking, know that help and support are available. The University has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, and more. The University strongly encourages all students to report any such incidents to the University. Please be aware that all University of Wyoming employees, including student staff, are required to report all Title IX related concerns to the Title IX Coordinator or their supervisor. This means that if you tell a faculty member about a situation of sexual harassment or sexual violence, or other related misconduct, the faculty member must share that information with the University's Title IX Coordinator. UW's Title IX Coordinator is Jim Osborn (Manager of Investigations, Equal Opportunity Report and Response). He is located in Room 320 of the Bureau of Mines Building, and can be reached via email at report-it@uwyo.edu or via phone at 766-5200 or 766-5228. For more information, go to: http://www.uwyo.edu/reportit/learn-more/faqs.html .

Attendance and Absence policies

Attendance is critical. There is no text book for ALL of the material. The only way to know what you need to know is by attending class. If you have an excused absence that is fine, try to get notes from the day you missed from one of your classmates. Just don't skip!

Classroom Behavior Policy

At all times, treat your presence in the classroom and your enrollment in this course as you would a job. Act professionally, arrive on time, pay attention, complete your work in a timely and professional manner. You will be respectful towards your classmates and instructor. Spirited debate and disagreement are to be expected in any classroom and all views will be heard fully, but at all times we will behave civilly and with respect towards one another. Personal attacks, offensive language, name-calling, and dismissive gestures are not warranted in a learning atmosphere. As the instructor, I have the right to dismiss you from the classroom.

Classroom Statement on Diversity

The University of Wyoming values an educational environment that is diverse, equitable, and inclusive. The diversity that students and faculty bring to class, including age, country of origin, culture, disability, economic class, ethnicity, gender identity, immigration status, linguistic, political affiliation, race, religion, sexual orientation, veteran status, worldview, and other social and cultural diversity is valued, respected, and considered a resource for learning.

Disability Support

If you have a physical, learning, sensory or psychological disability and require accommodations, please register as soon as possible and provide documentation of your disability to Disability Support Services (DSS), Room 109 Knight Hall. You may also contact DSS at (307) 766-3073 or udss@uwyo.edu. Visit their website for more information: www.uwyo.edu/udss

Academic Dishonesty Policies

Don't cheat on the exams. I expect you to take full advantage of all the online resources you can get your hands on. That includes Stack Overflow, Github etc. If you do use someone else's code, put in a link to where you found it. Don't cheat on the projects - do you own work. Most of the learning in the class is from *doing* the projects.

Substantive changes to syllabus

All deadlines, requirements, and course structure are subject to change if deemed necessary by the instructor. Students will be notified verbally in class, on our WyoCourses page announcement, and via email of these changes. I do travel during the semester. Class could be canceled or assignments due dates changed.

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