Independent Study Proposal: Blockchain Development Curriculum
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Faculty Member: Jonathon Magana
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Learning Outcomes:

- Explore various blockchain development topics in depth which I've previously haven't had time to explore
- Learn about how to create and deploy ASAs in the Algorand developer ecosystem
- Reinforce my current understanding of blockchain development concepts through creating learning material for others

Description of Independent Study:

The purpose of this independent study is to lay out the foundation for a course involving blockchain development which could be taught at MSOE. This course would be a three-credit technical elective which would primarily be meant for students in the CS/SE track. The pre-requisites for the course would be CS2852: Data Structures, and CS2911: Network Protocols. The course would consist of 22 lectures, divided into two 10 lecture sprints, with 2 additional lectures after the second midterm. In addition to these lectures, the course will contain 2 midterms, a final exam, 3 review periods (before each of the exams), and 3 days for students to show final presentations. The course would contain a couple of lab-esque assignments which would be designed during this independent study. While this course is designed to be taken in MSOE's quarter system, it could be redesigned for the semester system by adding additional assignments to it if demand for it is high after it's initially offered.

Proposed Method of Solution:

By the end of the independent study, enough material should be created/outlined such that it would be trivial for an MSOE instructor to create slide decks that match their teaching style based on the material outlines created in this independent study.

Proposed Course Material:

- W1: Introduction/Overview of Class/History of Blockchains, Blockchain Essentials & Cryptography, Blockchain Essentials Cont. & Consensus Mechanisms
- W2: PoW Mining/Transactions/UTXOs/Mempools, P2P Networks/Byzantine Fault Tolerance/Network Attacks, Signatures/Keys & Wallets
- W3: Intro to Assignment #1 + Work Time, Soft/Hard Forks, Network Fees/Scaling
- W4: Layer 2 Networks & Cross Chain Swaps, Midterm Review, Midterm #1
- W5: Introduction to Smart Contracts & Decentralized Applications, Ethereum & Smart Contract Platforms, Introduction to Algorand
- W6: Token Standards/ASAs, Non-Fungible Tokens, TestNet & Private Dev Networks

- W7: Setting up Algorand Dev Environment & Intro to Assignment #2, Blockchain Based Cybersecurity, Oracles & Sidechains/Sharding
- W8: ICOs & CBDCs & Blockchain Macroeconomics, Midterm Review, Midterm #2
- W9: Legal Discussions, Future Directions of Blockchain, Final Presentations Day #1
- W10: Final Presentations Day #2, Final Presentations Day #3, Final Exam Review

This material is likely to experience minor changes over the course of independent study as more is learned about these topics. If more/less time is deemed to be necessary to teach certain material, the faculty coordinator will be contacted with the proposed curriculum adjustments.

Deliverables:

The following deliverables should be provided on the following dates (adjustments may be made by the faculty coordinator as needed):

- (EOW1): Document containing detailed instructions on material for the week 1 lectures of the course
- (EOW2): Document containing detailed instructions on material for the week 2 lectures of the course
- (EOW3): Document containing detailed instructions on material for the week 3 & 4 lectures of the course
- (EOW4): Document containing student instructions for the first assignment (Creating a private cryptocurrency from scratch in python)
- (EOW5): Document containing detailed instructions on material for the week 5 lectures of the course
- (EOW6): Document containing detailed instructions on material for the week 6 lectures of the course
- (EOW7): Document containing detailed instructions on material for the week 7 & 8 lectures of the course
- (EOW8): Document containing student instructions for the first part of the second assignment (Creating an ASA token using smart contracts)
- (EOW9): Document containing student instructions for the second part of the second assignment (Deploying the ASA token to a private dev network)
- (EOW10): Document containing detailed instructions on material for the week 9 lectures of the course

Grading Criteria:

- Lecture Material Documents – 70%
- Assignment Material Documents – 30%