ISAT 480: Blockchain Technology & Cryptocurrency (Sec 4) – 3 credits

Spring 2018

Course and Instructor Information

Meeting Times:	M 5:30pm-7pm in Telepresence Lab (Lakeview Hall)
Instructors:	Morgan Benton, Ph.D. & Nicole Radziwill, Ph.D., MBA
Offices:	ISAT/CS 124 & ISAT/CS 105
Phone/SMS:	973.495.7736 (Benton), 703.835.6336 (Radziwill)--SMS/Email OK 24/7
Emails:	**Please include "480 Blockchain" in the subject of your emails to:** bentonmc@jmu.edu or radziwnm@jmu.edu nicole.radziwill@gmail.com
Office Hours:	By Appointment
Facebook Group:	https://www.facebook.com/groups/132114954153022/

Nature of Course Content

Course Description

This course provides an introduction to current and evolving issues around cryptocurrencies like Bitcoin and Ether, and the blockchain platform that supports them -- in particular the notions of trust, choice, consensus, control, and value. The purpose of this course is to get beyond the "hype" to understand what tasks blockchain is well suited for, and what tasks it is not suited for.

> "Blockchain needs a specific value proposition for the average user if it is going to gain real traction." --Ben Dickson, Venturebeat

The course is application-oriented and project-team based, and will include an examination of social, ethical, legal and policy issues. Extensive contributions from industry representatives will be a key aspect of this course.

Course Style & Delivery

This course implements the **[10 Principles of the Burning Mind Project](#)** as its core value system. As a result, you will have to take ownership for your own learning, and the course itself will be blended (integrating online and in-class components) and gift-oriented.
- **Blended**: Some of the work can be done online, at your leisure, but there will be scheduled in-class exercises to keep you on track. There will be ample open "lab" time, with instructor guidance, provided for you to complete your work.
- **Gift-Oriented**: In many classes, you may ask "what can I get out of taking this class?" However, in this course, we want you to ask the question "what can I give to others as a result of my participation in this class?" Individual gifts are an important component. As you explore the topics, we request that you identify things you are good at and skills or insights you can contribute to a larger, team effort.

Detailed Schedule (Subject to Change)

Date	Topic	Details
1/8	**Course Overview, Databases & History of Hype**	● Videos ○ [Brian Behlendorf, Hyperledger](#) (9 min) ○ [https://www.youtube.com/watch?v=v--lqndp0V4](#) (12 min) ● Readings ○ [https://hackernoon.com/blockchain-101-only-if-you-know-nothing-b883902c59f7](#) ○ [Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system.](#) ○ [Eisenstein, C. (2011). Sacred economics: Money, gift, and society in the age of transition. North Atlantic Books.](#) (Intro and Chapters 1-3) ○ [https://medium.com/@sbmeunier/blockchain-technology-a-very-special-kind-of-distributed-database-e63d00781118](#)
1/15	MLK Day--No class	● Deliverables ○ Weekly blog post ● Readings ○ [Eisenstein, C. (2011). Sacred economics: Money, gift, and society in the age of transition. North Atlantic Books.](#) (Intro and Chapters 1-3)
1/22	**Cryptocurrencies & Mathematical Foundations**	● Guest Speaker ○ Patrick McQuown (Tax Tokens), Sean Button (JMU Alum), Public Key/RSA/Elliptic Curve

		Cryptography Intro (Benton) ● Deliverables ○ Weekly blog post

1/29	**Cryptocurrency Overview**	● Guest Speaker
		   ○ John Feminella, Pivotal/UpHex
		● Deliverables
		   ○ Weekly blog post
		● Videos
		   ● https://youtu.be/jpCWCm4KbiM (5 min)
		● Readings
		   ● Triple Entry Accounting -
		    https://www.forbes.com/sites/forbesfinancecouncil/2017/11/28/triple-entry-accounting-and-blockchain-a-common-misconception

2/5	**Bitcoin Mining; Legal & Regulatory Issues, Energy Usage**	● Guest Speaker
		   ○ Yasmeen Drummond (?) - Women in Blockchain Davos Panel
		● Deliverables
		   ○ Weekly blog post
		● Videos
		   ○ TBD
		● Readings
		   ○ Using Bitcoin to evade sanctions
		    https://www.kommersant.ru/doc/3494552?tw
		   ○ Tezos violating securities laws
		    https://blog.evercoin.com/comparing-the-bitcoin-bubble-to-the-dotcom-bubble-97d6e3b3f817
		    https://www.kaspersky.com/blog/good-good-blockchain/19575/
		   ○ No, Bitcoin Won't Boil the Oceans
		    https://www.bloomberg.com/amp/view/articles/2017-12-07/bitcoin-is-greener-than-its-critics-think

2/12	**From Bitcoin to Blockchain**	● Guest Speaker
		   ○ Chris Miller, CryptoTech (& JMU Alum)
		● Deliverables
		   ○ Weekly blog post
		● Videos
		   ○ https://youtu.be/jpCWCm4KbiM (5 min)
		● Readings
		   ○ Triple Entry Accounting -
		    https://www.forbes.com/sites/forbesfinancecouncil/2017/11/28/triple-entry-accounting-

		[and-blockchain-a-common-misconception](#)
2/19	**Blockchain Platforms**	- Guest Speaker - Brian Sletten - tentative - Deliverables - Weekly blog post - Videos - TBD - Readings 17 Blockchain Platforms - https://medium.com/blockchain-blog/17-blockchain-platforms-a-brief-introduction-e07273185a0b
2/26	**Blockchain Applications**	- Guest Speaker - TBD - Deliverables **First Draft of your Chapter (1500-2000 words)** - Videos - TBD - Readings - Name Our Baby on the Blockchain: https://etherscan.io/address/0x8eaffe914e5bbf6784236d3f702549d8c9533d03 https://cryptobabyname.com/
3/12	**Security & Cryptocurrency-Targeting Malware**	- Guest Speaker - Bob Rudis, Rapid7 (& Author) - tentative - Deliverables - Weekly blog post - Videos - TBD - Readings - TBD
3/19	**Smart Contracts**	- Guest Speaker - TBD - Deliverables - Weekly blog post - Videos - TBD - Readings - TBD
3/26	**Build Your Own Blockchains**	- Guest Speaker - TBD - Deliverables

		○ Weekly blog post
		● Videos
		    ○ TBD
		● Readings
		    ○ TBD

4/2	**Build Your Own Blockchains**	● Guest Speaker
		    ○ TBD
		● Deliverables
		    ○ Weekly blog post
		● Videos
		    ○ TBD
		● Readings
		    ○ Build a tiny blockchain in Python
		        https://medium.com/crypto-currently/lets-build-the-tiniest-blockchain-e70965a248b

4/9	**Hyperledger**	● Guest Speaker
		    ○ TBD
		● Deliverables
		    ○ Weekly blog post
		● Videos
		    ○ TBD
		● Readings
		    ○ Hyperledger "Fabric"
		        https://www.ibm.com/developerworks/cloud/library/cl-ibm-blockchain-101-quick-start-guide-for-developers-bluemix-trs/index.html

4/16	**VCs, Business Opportunities, & ICOs**	● Guest Speaker
		    ○ Riva?
		● Deliverables
		    ○ **Final Draft of your Chapter**
		● Videos
		    ○ TBD

4/23	*No class while book is being edited*	*None*
4/27	1st Annual Innovation Summit	**Attendance is Mandatory as many, if not all, of you will be presenting**

Goals of the Course

The overall goal is for us to write and produce a **book** capturing the results of our learning this semester so that people not in this class can benefit from our experiences. Each person will be responsible for delivering a *very well written* 1500-2000 word chapter (about the size of an average blog post) near the end of the semester, which will be compiled and professionally edited before publication -- with the goal of providing each student a copy of our product by the end of finals week. Our weekly work has been designed to help us iteratively cover topics in many categories, including Bitcoin and blockchain fundamentals, blockchain platforms, other cryptocurrencies, energy requirements, security requirements, regulations, social context, security, and tutorials.

Objectives

- **Demonstrate excellent writing skills,** including identifying appropriate high-quality source material, extracting key concepts, and presenting them concisely
- **Explain (to clients, managers, co-workers, etc.) what a "blockchain" is, what a "cryptocurrency" is, and the difference between them**
    - Explain the concepts of ledgers, distributed ledgers, and smart contracts
    - Describe the mathematics (e.g. elliptic curve cryptography, SHA-256, Merkle Trees) behind some of these technologies
    - Explain the different types of databases that are available, including centralized vs. distributed, relational vs. non-relational, hybrid databases, and distributed ledgers
    - Implement a basic blockchain, and/or an application based on one (e.g. using Solidity, IOTA, or Ethereum platform)
- **Develop a deep understanding of the nature of "money"**
    - Describe the purpose(s) of money
    - Be able to articulate a summary of the history of money
    - Describe the nature of and interrelationships between trust, control, consensus and value as they relate to current forms of money
- **Identify key issues surrounding adoption of blockchain and cryptocurrencies**
    - Describe the socio-political and macroeconomic implications of the widespread use and implementation of distributed ledger technology
    - Describe the nature of and interrelationships between trust, control, consensus and value as envisioned by proponents of various cryptocurrencies
    - Describe the political, legal, social, and economic pitfalls and hurdles that cryptocurrency must overcome to live up to the hype
- **Articulate the ethical issues at**
- **Describe the pros and cons of different blockchain platforms**
    - Understand the similarities and differences between blockchain, hashgraph, holochain, and blockchain-inspired innovations

- ○ Explain the pros, cons, similarities, and differences between blockchain based systems (e.g. Hyperledger, R3 Corda, Disledgers, BigChainDB, Ethereum)
        - ○ Describe blockchain security and how it can be breached or manipulated
- **Explain "the hype" -- why people claim this is the biggest innovation since the internet**
        - ○ Form your own opinion on the matter and be able to explain/justify it to anyone
        - ○ Describe the process for buying and selling cryptocurrencies
        - ○ Identify risks associated with trading cryptocurrencies

Grading

Your goal in this course, for the purpose of grading, is to produce artifacts that demonstrate your understanding of the topics that we cover, and that provide value to real clients and/or real people (including your instructors, the students within your learning community, students who will participate in future learning communities, and the world outside JMU). Grading is based on accrued points for completing various labs, exams, and projects, to the satisfaction of the instructor and/or instructor-designated proxies.

Grading Scale:

Grade	Points
A	129-150
A-	120-128
B+	111-119
B	99-110
B-	90-98

C+	81-89
C	69-80
C-	60-68
D+	51-59
D	39-50
D-	30-38
F	0-29

How To Earn Points

Attendance (2pts/wk)

Showing up for class **on time** each week will allow you to earn 2 points. "On time" means that you are there when we call the roll. If you are late, but show up within the first 45 minutes of class, you can earn one point for that week.

Weekly Resource Review Blog Post (2pts/wk)

Each week, you will be expected to write one resource review blog post. These reviews must be posted by 5pm Friday every week. Late submissions will not be eligible to receive points. Things that are eligible subjects for review include:

1. Refereed, i.e. peer-reviewed, journal articles and/or books. These are typically (but not always) the kinds of resources one finds at Google Scholar. If you are not sure whether a resource is "refereed" or "peer-reviewed" please ask an instructor. [Note: There is a new peer-reviewed journal called *Ledger* dedicated to these topics.] You can also find

high-quality source material curated by top universities, e.g. this Stanford syllabus: https://crypto.stanford.edu/cs251/syllabus.html

2. High-quality articles that appear online. These don't have to be scholarly, but should be of general interest to people who are interested in learning about cryptocurrencies and blockchain. They might appear in traditional news sources (e.g. NYT, CNN, Wired, etc.), in more industry-focused blogs or websites (e.g. Coindesk, Bitcoin Magazine, BTC Media), or might come from the personal blog of someone in tech, finance, academia, etc. Gaining the ability to determine what counts as "high-quality" is one of the goals of this exercise.

3. Some other writing, video, podcast or other informational or instructional material that fits within the theme of our blog, and is of high quality. If you're not sure if a resource "counts," please ask an instructor. Over the course of the class, you should develop the ability to make this judgment accurately for yourself.

Your blog post should consist of four things:

1. A link to the resource along with its full citation in APA format
2. A short summary that will help readers decide if they want to read the whole article
3. A short review and/or analysis
4. Your determination of the appropriate tag(s)/category(ies) for this resource

The summary should be at most 2-3 sentences (<50 words). It should **not** be just a copy/paste of the article's abstract, but something that you wrote yourself. Plagiarizing from the actual source will result in rejection of your post. The summary should help a person decide whether or not they would like to read the whole article for themselves.

The review should also be short, i.e. <300 words. It's fine if you go over the word count a little, but the goal here is to say as much as you can in as few words as possible. Brevity is a virtue. Your review should state clearly what you believe to be the strengths and weaknesses of the resource being reviewed and why. This, also, should help a person decide whether or not to consume the entire resource.

All of the reviews on the site will need to be categorized. The categorization scheme will grow organically over the semester. When you create a new review, you will assign it to either an existing category, or create a new category. A review can belong to **multiple** categories. Your classmates will help determine if the categories are appropriate, or need to be changed. Categories should be relatively **general**, i.e. "cryptocurrency", or "tutorial", or "ICO." Site visitors use categories to determine their general area of interest, when reading.

In addition to categories, you should also suggest tags for your review. Tags are more specific and may contain the names of specific technologies, currencies, people, companies, trends, or events. Tags allow site visitors to search for specific items of interest according to their names. So for example, they might be interested in just Bitcoin. "Bitcoin" would be a tag, whereas

"cryptocurrency" would be the category. Over the course of the semester you should develop the ability to distinguish between a "tag" and a "category" and to use them according to the editorial style of our blog.

Your instructors may reject your review if it does not meet the standards of the class. You will receive notification of rejection by the start of the class following the Friday in which your review was posted. If you do not receive a rejection notification by then, the review is accepted. Upon rejection, you will receive written feedback as to the reason for the rejection. For your **first three** rejections, you will have the opportunity to redo your review to get credit for it. If you choose to redo your review, the redo is due by the Friday immediately following the rejection. After three rejections, you will still be able to do reviews, but you will not have the ability to redo them if they are rejected. The goal here is for everyone to learn and be able to live up to the editorial standards of our blog and our book. The number of redos is limited because we don't everyone to turn in crap every week just to get it in before the deadline.

Voting, Categorization, and Tagging of Weekly Reviews (3pts/wk)

After your classmates have submitted their weekly resource reviews, we need your help in determining their quality and how they should be tagged and categorized. You should read the reviews 66,.

Final Chapter Submission (20 pts)

Because you will have ample opportunities to work with us throughout the semester to perfect your final product, your submission should be of very high quality by the time it is due in mid-April. Please start your work on the final deliverable as early in the semester as possible, once you have determined an appropriate topic with your professors.

Requirements & Policies

Textbooks & Software

Eisenstein, C. (2011). *Sacred economics: Money, gift, and society in the age of transition*. North Atlantic Books. (Read Online | Purchase)

Dates & Deadlines

All of the dates related to adding, dropping, and withdrawing from this course are in the JMU catalog and are posted on the University Registrar's website. **YOU ARE RESPONSIBLE FOR KNOWING THESE DATES**. Professors are not required to grant grades of "WP" or "WF" after

that date. If you have an extraordinary situation you may be granted an "I," but only under extraordinary and unanticipated circumstances that you discuss with me in advance.

Policies & Procedures

Late Work

IN GENERAL, NO LATE WORK WILL BE ACCEPTED. Any accommodations (e.g. for sickness) must be made ahead of time with me before class or the time at which the assignment is due. As long as there is a justifiable reason that I agree with, I will be as flexible as I can to help you complete the requirements for this course. The most important part is setting my expectations effectively.

Attendance

Attendance at ALL class meetings is required. Students who miss more than 1 (unexcused) and 2 total (excused + unexcused) will have their grade reduced by one letter. More than 3 total absences (excused + unexcused) will result in course failure.

Class Participation and Assigned Reading

Please read the material before coming to class so that you will get the most out of our session and are able to discuss the day's topics and ask cogent questions. Questioning and discussing in class is expected and will contribute to your final grade for the class.

Class or Work Missed for Extraordinary Circumstances

Any student who seeks to be excused from class for extraordinary circumstances such as a prolonged illness or the death of a family member has the personal responsibility to inform the instructors as soon as knowledge of the absence becomes known, preferably by email. It is the sole responsibility of the student to meet with an instructor immediately upon return to campus to work out a schedule of when and how missed work will be made up. If there is a delay by the student of more than 24 hours upon return to campus in contacting an instructor to work out a schedule to make up missed work, and missed work is returned to the class in the interim, the student will not be allowed to make up the missed work and will receive a zero for the missed work.

Honor Code

You are expected to abide by the JMU Honor Code at all times. Violations of the JMU Honor Code will be dealt with in accordance with the policy that permits professors, at their own discretion, to assess and penalize students for cheating. All incidents of academic dishonesty will be reported to the Honor Committee, according to the requirements of the university.

Special Needs

If you are a student who is registered with the Office of Disabilities, your instructors need to be given written documentation to support your situation in order to provide you with any accommodations (this is required by law). YOU are responsible for pre-arranging with your instructors to provide accommodations (e.g., additional time for an exam). It is suggested that you send an email a few days ahead of time so that arrangements can be made. In your email, you need only say that you are seeking to arrange for your accommodation; you do not need to elaborate in your email.

Working in Groups

We fully support active collaboration with acknowledgement and citation.