University of Oklahoma

College of Engineering

Computer Science 5970:
Blockchains & Cryptocurrencies

Spring 2022

Instructor:	Anindya Maiti
Office:	DEH 546
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Office Hours:	Tuesdays 02:00 PM to 04:00 PM, or by appointment
Class Times:	Tuesdays and Thursdays, 12:00 PM to 01:15 PM
Class Location:	Carson Engr Ctr 441
Credit Hours:	3.0
Course Prerequisite:	CS2413, and CS3823 or CS4413; or permission of instructor.

Course Description

Cryptocurrencies are a new form of digital currency technology that has the potential of altering payments and economics around the world. In between the optimism surrounding cryptocurrencies' evolution as an alternate form of currency and the pessimism related to its security, success and adoptability, there is significant confusion and lack of understanding at the technical level about its precise architecture and operation. This course attempts to bridge this gap in the technical understanding of Bitcoin and the working of other popular cryptocurrency platforms. Specifically, this course will address the following fundamental questions: What are cryptocurrencies? How does the technical foundation, i.e., the distributed ledger or Blockchain technology, facilitate such an online currency system? How does cryptocurrencies work and how is it different from other forms of online currencies? How secure are cryptocurrencies? How anonymous are cryptocurrency users? What applications can be built using Blockchain as a platform? Can cryptocurrencies be regulated? What is the future of cryptocurrencies? What are some the popular forms of cryptocurrencies, and how are they different from each other, both, functionally and technically?

Measurable Student Learning Outcomes:

After passing this course, students will be able to:

1) Describe how Blockchains and cryptocurrencies work.

2) Identify and analyze security and anonymity issues surrounding cryptocurrencies, and limitations and future of cryptocurrencies and other Blockchain-based technologies.

3) Develop code and computer programs for designing and building cryptocurrencies.

Required Texts and Materials

Bitcoins and Cryptocurrencies Technologies – A Comprehensive Introduction, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller & Steven Goldfeder, 2016, Princeton University Press. (ISBN- 9780691171692). A free pre-publication online (non-printable) PDF version of the book can be found here: http://bitcoinbook.cs.princeton.edu/ *and can be used for this course.*

Grading Policy

Your letter grade will be based on the following components: Total out of 100%

Mini Tests/Quizzes – 50%

Labs/Programming Assignments – 20%

Course Paper and Presentation – 30%

The final letter grade for the course will be assigned based on the following distribution of the obtained grades.

Percentage obtained	Letter grade
>= 90	A
>= 80 and < 90	B
>= 70 and < 80	C
>= 60 and < 70	D
< 60	F

Students should note that there is no "extra-credit" for this course and requests for earning extra-credit or making-up grades will not be entertained.

Course Announcements and Updates

All course related announcements and content will be posted on the course webpage on Canvas (http://canvas.ou.edu). *All course related assignment submissions should be done using the course's Canvas page only.* Course related grades will be posted only on Canvas. Students are expected to, and are responsible for, regularly monitoring the course page on Canvas. Students should also make sure that they receive emails and announcements sent by the instructor through Canvas. The instructor reserves the right to make reasonable changes in the syllabus as the course progresses. The latest syllabus will be posted on Canvas and

students will be notified of any changes to syllabus through Canvas announcements and emails.

Attendance and Participation

This course will follow a face-to-face or in-person model of instruction. Attendance is not mandatory, however highly recommended for students to satisfactorily achieve their learning goals. Attendance will not be taken and will not contribute towards your grade. Each week, the instructor will post reading assignments and lecture slides on the scheduled topic for that week on Canvas.

In-class Mini-tests and Quizzes

There will be a total of 6 short in-class *mini-tests* and/or *quizzes*. The topic for each test/quiz will be announced at least a week prior to the date of the test/quiz. **These quizzes/tests are expected to take place in the classroom during the regular course meeting times**. Students are expected to come prepared to take the quiz/test on the scheduled day. There will be no make-up quizzes unless there is a strong well-documented reason for missing the quiz/test. Some acceptable reasons include, but are not limited to, medical emergencies, emergency in family, jury duty, military service, and religious event. Please inform the instructor of your emergency/reason of absence, along with the appropriate documentation, as early as possible. The instructor will make the final call on whether to grant the leave of absence and provide make-up quizzes/tests. For requesting any exceptions to these rules, please contact and discuss your concern directly with the instructor.

Labs/Programming Assignments

This course comprises of 3 *labs/programming assignments* which will focus on different aspects of designing, building, and interacting with cryptocurrencies and blockchains. All students must complete these labs individually. Programming assignments are generally due on Canvas on the deadline date specified beforehand. No late assignment submissions beyond the official deadline will be accepted (and graded) and will automatically receive zero points, unless there is a STRONG well-documented reason, as outlined above.

Course Paper and Presentation

All students are expected to complete a *course paper* on any topic of interest (to the student) related to Bitcoins and Cryptocurrencies. Some example topics include: current state-of-the-art of security and anonymity in cryptocurrency, alternate cryptocurrency technologies, history of security/privacy attacks on Blockchains, Quantum-secure Blockchains and impact of quantum computing paradigm on Blockchains and cryptocurrencies, application of Blockchains besides cryptocurrencies, etc. Please note that these are just sample topics and students are encouraged to discuss the topic that they want to pursue for the paper with the

instructor before working on the paper. Students are expected to submit a maximum 10-page course paper by the deadline date and make an in-class presentation of their paper during the final two weeks of the class. The exact presentation schedule and slots will be finalized during the semester. **Students can complete the course paper and presentations either individually or in groups of (maximum) two students.** This assignment is worth 30% (20% for the paper and 10% for the presentation) of your total grade.

Important Academic Dates

For the Spring 2022 semester, classes begin on Jan 18, 2022. OU academic calendar for Spring 2022 semester can be found at: https://www.ou.edu/registrar/academic-calendars/spring-2022-academic-calendar

Tentative Schedule*

Week	Topics
1	Course Introduction, Introduction to Information Security and Cryptography
2	Introduction to Cryptography, Blockchains, and Cryptocurrencies
3	How Bitcoin Achieves Decentralization
4	How Bitcoin Achieves Decentralization (*Quiz 1*)
5	Mechanics of Bitcoin
6	Mechanics of Bitcoin (*Quiz 2*)
7	How to Store and Use Cryptocurrencies (*Lab 1*)
8	How to Store and Use Cryptocurrencies (*Quiz 3*)
9	Mining in Blockchains (*Lab 2*)
10	Mining in Blockchains (*Quiz 4*)
11	Cryptocurrencies and Anonymity
12	Cryptocurrencies and Anonymity (*Lab 3*)
13	The future of Blockchains and Cryptocurrencies (*Quiz 5*)
14	Student Course Paper Presentations
15	Student Course Paper Presentations (*Quiz 6, Final Course Papers due on Canvas*)

*The schedule and due dates of the various assignments are tentative and subject to change. Please refer to the course page on Canvas for the most up-to-date information.

University Policies

Copyright Syllabus Statement for In-Person or Online Courses

Sessions of this course may be recorded or live-streamed. These recordings are the intellectual property of the individual faculty member and may not be shared or reproduced without the explicit, written consent of the faculty member. In addition, privacy rights of others such as students, guest lecturers, and providers of copyrighted material displayed in the recording may be of concern. Students may not share any course recordings with individuals not enrolled in the class or upload them to any other online environment.

Religious Observance

It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty.

Reasonable Accommodation Policy

The Accessibility and Disability Resource Center is committed to supporting students with disabilities to ensure that they are able to enjoy equal access to all components of their education. This includes your academics, housing, and community events. If you are experiencing a disability, a mental/medical health condition that has a significant impact on one or more life functions, you can receive accommodations to provide equal access. Possible disabilities include, but are not limited to, learning disabilities, AD(H)D, mental health, and chronic health. Additionally, we support students with temporary medical conditions (broken wrist, shoulder surgery, etc.) and pregnancy. To discuss potential accommodations, please contact the ADRC at 730 College Avenue, (ph.) 405.325.3852, or adrc@ou.edu.

Title IX Resources and Reporting Requirement

For any concerns regarding gender-based discrimination, sexual harassment, sexual assault, dating/domestic violence, or stalking, the University offers a variety of resources. To learn more or to report an incident, please contact the Sexual Misconduct Office at 405/325-2215 (8 to 5, M-F) or smo@ou.edu. Incidents can also be reported confidentially to OU Advocates at 405/615-0013 (phones are answered 24 hours a day, 7 days a week). Also, please be advised that a professor/GA/TA is required to report instances of sexual harassment, sexual assault, or discrimination to the Sexual Misconduct Office. Inquiries regarding non-discrimination policies can be directed to University Equal Opportunity Officer and Title IX Coordinator at 405/325-3546 or smo@ou.edu . For more information, visit http://www.ou.edu/eoo.html.

Adjustments for Pregnancy/Childbirth Related Issues

Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact your professor or the Disability Resource Center at 405/325-3852 as soon as possible. Also, see http://www.ou.edu/eoo/faqs/pregnancy-faqs.html for answers to commonly asked questions.

Emergency Protocol

During an emergency, there are official university procedures that will maximize your safety.

Severe Weather: If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather 1. LOOK for severe weather refuge location maps located inside most OU buildings near the entrances 2. SEEK refuge inside a building. Do not leave one building to seek shelter in another building that you deem safer. If outside, get into the nearest building. 3. GO to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in an innermost room. Avoid outside doors and windows. 4. GET IN, GET DOWN, COVER UP. 5. WAIT for official notice to resume normal activities.

Armed Subject/Campus Intruder:

If you receive an OU Alert to shelter-in-place due to an active shooter or armed intruder situation or you hear what you perceive to be gunshots:

1. GET OUT: If you believe you can get out of the area WITHOUT encountering the armed individual, move quickly towards the nearest building exit, move away from the building, and call 911. 2. HIDE OUT: If you cannot flee, move to an area that can be locked or barricaded, turn off lights, silence devices, spread out, and formulate a plan of attack if the shooter enters the room. 3. TAKE OUT: As a last resort fight to defend yourself.

For more information, visit http://www.ou.edu/emergencypreparedness.html

Fire Alarm/General Emergency:

If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates: 1. LEAVE the building. Do not use the elevators. 2. KNOW at least two building exits 3. ASSIST those that may need help 4. PROCEED to the emergency assembly area 5 ONCE safely outside, NOTIFY first responders of anyone that may still be inside building due to mobility issues. 6. WAIT for official notice before attempting to re-enter the building.

Mental Health Support Services:

If you are experiencing any mental health issues that are impacting your academic performance, counseling is available at the University Counseling Center (UCC). The Center

is located on the second floor of the Goddard Health Center, at 620 Elm Rm. 201, Norman, OK 73019. To schedule an appointment call (405) 325-2911.

For more information please visit http://www.ou.edu/ucc.