University of Oklahoma

College of Engineering

Computer Science 5833:
Blockchains & Cryptocurrencies

Spring 2026

Instructor:	Anindya Maiti, am@ou.edu
Teaching Assistant	NA
Office Hours:	Wednesdays 11 am – 12 pm DEH 460
Class Times:	TR 10:30am - 11:45am
Class Location:	Carson 438
Credit Hours:	3.0
Course Prerequisite:	CS3823 or CS4413

Course Description

This course is designed to provide students with a comprehensive understanding of the foundational principles and practical applications of blockchain technology and cryptocurrencies. The curriculum focuses on how public Layer 1 blockchains operate as distributed data structures, emphasizing the social, economic, and technical dimensions of achieving consensus. Students will explore how these systems enable cryptocurrencies and decentralized applications, while addressing critical challenges in the blockchain ecosystem, such as security, anonymity, and scalability. The course also examines the blockchain trilemma—balancing security, scalability, and decentralization—and evaluates how real-world implementations tackle these issues. Through hands-on experience, students will learn to design and implement blockchain-based solutions, gaining skills in coding, consensus mechanisms, and the development of secure and future-ready decentralized applications. By the end of the course, participants will have the knowledge and tools to engage deeply with this transformative technology.

Measurable Student Learning Outcomes:

After passing this course, students will be able to:

1. Explain how public Layer 1 blockchains function as distributed data structures—focusing on the social, economic, and technical dimensions of consensus—and illustrate how these systems enable cryptocurrencies and decentralized applications.
2. Analyze security, anonymity, and scalability challenges in public blockchain ecosystems, including the trilemma of security, scalability, and decentralization, and assess how these challenges are addressed in real-world implementations.

3. Design and implement blockchain-based solutions, demonstrating proficiency in coding and consensus mechanisms for building cryptocurrencies and decentralized applications, while applying best practices for security and future-focused development.

Suggested Textbooks

1. 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.
2. Mastering Ethereum, Andreas M. Antonopoulos & Gavin Wood, 2018, O'Reilly Media. (ISBN-9781491971946). A free online version of the book can be found here: https://github.com/ethereumbook/ethereumbook and can be used for this course.

Grading Policy

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

In-class Quizzes (after dropping lowest) – 50%

Labs – 20%

Individual Course Project – 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

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 it is highly recommended for students to satisfactorily achieve their learning goals.

Tentative Schedule*

Week	Topics	Notes
1	Course Introduction, Fundamentals of Information Security and Cryptography	Quiz 1 on Fundamentals
2	Introduction to Cryptography, Blockchains, and Cryptocurrencies	
3	Decentralization in Bitcoin	Quiz 2
4	Mechanics of Bitcoin	
5	More on Mechanics of Bitcoin	Quiz 3
6	Storing and Using Cryptocurrencies	Lab 1
7	Mining in Proof-of-Work Blockchains	Quiz 4
8	Mining Processes and Challenges	Lab 2
9	Cryptocurrencies and Anonymity	Quiz 5
10	Introduction to Ethereum: Transition to Proof-of-Stake	
11	Ethereum: Data Availability, Consensus, and Execution Layers	
12	Ethereum Virtual Machine and Smart Contracts	Lab 3, Quiz 6
13	Building Decentralized Applications on Ethereum	
14	Ethereum Token Standards	
15	Future of Blockchain, Cryptocurrencies, and Decentralized Applications	Project Due End-of-Week

*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.

In-class Quizzes

There will be a total of 6 in-class *quizzes*. The topic for each quiz will be announced prior to the date of the quiz. **These quizzes are expected to take place in the classroom during the regular course meeting times**. Students are expected to come prepared to take the quiz on the scheduled day. **The lowest quiz score will be dropped when calculating the final grade.** There will be no make-up quizzes unless there is a strong well-documented reason for missing *multiple quizzes*. 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. 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. Some of the labs/programming assignments may also be conducted in the classroom during the regular course meeting times. 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. Students must bring their laptop and charger to class for completing any in-class labs.

Course Project

All students are expected to complete a *course project* on a unique recent topic of interest related to blockchains, cryptocurrencies, and decentralized application. Individual project topics and the schedule for selection will be announced during the semester, with topics assigned on a first-come, first-served basis. **Students can complete the course project either individually or in groups of (maximum) two students.** This project is worth 30% of the total grade.

Reading Assignments

Reading assignments will be regularly posted on Canvas. Students are expected to complete the reading assignment before coming to course lectures and in-class activities. Reading the appropriate topics from the textbook prior to attending lectures helps to better follow the covered course content. Reading assignments are for self-study purposes, do not require submissions, and will not be graded.

Important Academic Dates

For the Spring 2026 semester, classes begin on Jan 20, 2026. OU academic calendar for Spring 2026 semester can be found at: https://www.ou.edu/content/dam/registrar/docs/2025-2026/academic-calendar/2025-2026%20calx-chronological.pdf

Course 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.

University Policies

Mental Health Support Services

Support is available for any student experiencing mental health issues that are impacting their academic success. Students can either been seen at the University Counseling Center (UCC) located on the second floor of Goddard Health Center or receive 24/7/365 crisis support from a licensed mental health provider through TELUS Health. To schedule an appointment or receive more information about mental health resources at OU please call the UCC at 405-325-2911 or visit University Counseling Center. The UCC is located at 620 Elm Ave., Room 201, Norman, OK 73019.

Title IX Resources and Reporting Requirement

The University of Oklahoma faculty are committed to creating a safe learning environment for all members of our community, free from gender and sex-based discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking, in accordance with Title IX. There are resources available to those impacted, including: speaking with someone confidentially about your options, medical attention, counseling, reporting, academic support, and safety plans. If you have (or someone you know has) experienced any form of sex or gender-based discrimination or violence and wish to speak with someone confidentially, please contact OU Advocates (available 24/7 at 405-615-0013) or University Counseling Center (M-F 8 a.m. to 5 p.m. at 405-325-2911).

Because the University of Oklahoma is committed to the safety of you and other students, and because of our Title IX obligations, I, as well as other faculty, Graduate Assistants, and Teaching Assistants, are mandatory reporters. This means that we are obligated to report gender-based violence that has been disclosed to us to the Institutional Equity Office. This means that we are obligated to report gender-based violence that has been disclosed to us to the Institutional Equity Office. This includes disclosures that occur in: class discussion, writing assignments, discussion boards, emails and during Student/Office Hours. You may also choose to report directly to the Institutional Equity Office. After a report is filed, the Title IX Coordinator will reach out to provide resources, support, and information and the reported information will remain private.

For more information regarding the University's Title IX Grievance procedures, reporting, or support measures, please visit Institutional Equity Office at 405-325-3546.

Reasonable Accommodation Policy

The University of Oklahoma (OU) is committed to the goal of achieving equal educational opportunity and full educational participation for students with disabilities. If you have already established reasonable accommodations with the Accessibility and Disability Resource Center (ADRC), please submit your semester accommodation request through the ADRC as soon as possible and contact me privately, so that we have adequate time to arrange your approved academic accommodations.

If you have not yet established services through ADRC, but have a documented disability and require accommodations, please complete ADRC's pre-registration form to begin the registration process. ADRC facilitates the interactive process that establishes reasonable accommodations for students at OU. For more information on ADRC registration procedures, please review their Register with the ADRC web page. You may also contact them at (405)325-3852 or adrc@ou.edu, or visit www.ou.edu/adrc for more information.

Note: disabilities may include, but are not limited to, mental health, chronic health, physical, vision, hearing, learning and attention disabilities, pregnancy-related. ADRC can also support students experiencing temporary medical conditions.

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. [See Faculty Handbook 3.15.2]

Adjustments for Pregnancy/Childbirth Related Issues

Should you need modifications or adjustments to your course requirements because of pregnancy or a pregnancy-related condition, please request modifications via the Institutional Equity Office website or call the Institutional Equity Office at 405/325-3546 as soon as possible. Also, see the Institutional Equity Office FAQ on Pregnant and Parenting Students' Rights for answers to commonly asked questions.

Final Exam Preparation Period

Pre-finals week will be defined as the seven calendar days before the first day of finals. Faculty may cover new course material throughout this week. For specific provisions of the policy please refer to OU's Final Exam Preparation Period policy.

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.

Additional Weather Safety Information is available through the Department of Campus Safety.

The University of Oklahoma Active Threat Guidance

The University of Oklahoma embraces a Run, Hide, Fight strategy for active threats on campus. This strategy is well known, widely accepted, and proven to save lives. To receive emergency campus alerts, be sure to update your contact information and preferences in the account settings section at one.ou.edu.

RUN: Running away from the threat is usually the best option. If it is safe to run, run as far away from the threat as possible. Call 911 when you are in a safe location and let them know from which OU campus you're calling from and location of active threat.

HIDE: If running is not practical, the next best option is to hide. Lock and barricade all doors; turn of all lights; turn down your phone's volume; search for improvised weapons; hide behind solid objects and walls; and hide yourself completely and stay quiet. Remain in place until law enforcement arrives. Be patient and remain hidden.

FIGHT: If you are unable to run or hide, the last best option is to fight. Have one or more improvised weapons with you and be prepared to attack. Attack them when they are least expecting it and hit them where it hurts most: the face (specifically eyes, nose, and ears), the throat, the diaphragm (solar plexus), and the groin.

Please save OUPD's contact information in your phone.

NORMAN campus: *For non-emergencies call (405) 325-1717. For emergencies call (405) 325-1911 or dial 911.*

TULSA campus: *For non-emergencies call (918) 660-3900. For emergencies call (918) 660-3333 or dial 911.*

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.

OU Fire Safety on Campus