

ECE 382V: Blockchain and Smart Contracts (Fall 2022)

Unique Numbers:	EE – 18094
Class Time:	See Course Schedule
Classroom:	In-person See Canvas for Zoom link

Instructor:	Sriram Vishwanath (E-mail: sriram@utexas.edu) Christopher Scott (E-mail: cscottdev@protonmail.com) D++ (E-mail: dplusplus@gmail.com)
Office Hours:	By appointment
Communicating:	Please communicate via joining our Discord at: https://discord.gg/cvSjuCsruK <u>Please do not use the Canvas Inbox.</u> Create a GitHub repository to store your assignments. - <i>Add Professor Scott (cmd#7777) and Professor D++ (D++#6290) as “Friends” on Discord.</i> - <i>Create a new Group DM to us both with a link to your GitHub.</i>

Course Overview

Course Mission

Every student should leave this class with an understanding of how bitcoin works, as well as 2nd layer protocols built on top of bitcoin. They should also learn to contribute to bitcoin projects and have their own functioning project.

Learning Outcomes

- The Bitcoin protocol
 - Transactions
 - Blocks
 - Bitcoin script
 - Forks
 - Segwit & Taproot
- The Lightning Network
 - BOLTs
 - HTLCs
 - Eltoo
- Smart Contracting Layers
 - Lightning
 - DLCs
- Building on bitcoin

- Popular projects
 - How to interface with the network
- Bitcoin privacy
 - Coinjoin
 - Coinswap

Required Resources

- **Textbook**: This course does not require you to purchase any textbook
- **Non-Required Readings**: Relevant review material or Internet links for the review material will be posted on GitHub.
 - Mastering Bitcoin
 - Grokking Bitcoin
 - Mastering Lightning
 - Programming Bitcoin
 - The Bitcoin Standard

How to be successful in this course

- **Prepare before class** – You should be diligent about making time to prepare before each class by reading the assigned material to familiarize yourself with the concepts that will be discussed and applied in class.
- **Be engaged in class** – Get to know your classmates and instructors. Participate in class discussions with enthusiasm. Don't hesitate to ask your classmates and instructors questions. We encourage questions.
- **After class** – Finish any assignments that we did not complete during class hours and work on your projects.

Fairness, Assignment Deadlines, and Time Management

Deliverables are assigned because work outside of class supplements and reinforces learning. Deliverables are also due at designated times and in specific formats, all of which will be described in assignment criteria. To be fair to everyone in class and to get assignments graded and returned in a timely fashion, we have to have deadlines. Please turn things in on time.

- Remember we **do not offer extensions** and **assignments cannot be made up**.
- PLEASE double-check deliverables submitted through Canvas to make sure your assignment file is attached. **If your file is not attached, or is corrupted, or in some way does not meet the requirements of the assignment, you will not receive credit for the assignment!**
 -

Questions about Grades

If you have a question about a posted grade, you must inquire about it in email format within **ONE WEEK of the day the grade is posted on Canvas**. After the one-week window, your grade for that assignment is permanent. Please note that grades for course deliverables close to the end of the semester will be considered permanent since we won't have time to apply the one-week window at the end of the semester.

Emergencies

In the rare case of an emergency that is *out of your control* you should send a note to "Instructors" through Piazza as soon as possible. You can also text the Instructor using the contact information provided. If you are requesting an extension, suggest a date for that

extension but please note the extension may not be given. Please also call Student Emergency Services (SES) at 512-471-5017 immediately. SES will document the situation privately with you and notify your professors about an extension. More info can be found at <https://deanofstudents.utexas.edu/emergency/>

Grading Policy

Grading for this case will use the following breakdown:

Assignment	Weight
Class Project	33.33%
Assignments	33.33%
Participation + Collaboration	33.33%
Total	100%

Email Usage Guidelines

Please add the Instructor's emails to your email contact list so our emails to you are not sent to your junk folder. Please **DO NOT** use Canvas' message feature.

Information Privacy

Password-protected class sites, such as Canvas, are available for all accredited courses taught at the university. Syllabi, handouts, assignments, and other resources are types of information that may be available within these sites. Site activities could include: exchanging email, engaging in class discussions and chats, and exchanging files. In addition, class email rosters are a component of the sites. Students who do not want their names included in these electronic class rosters must restrict their directory information in the Office of the Registrar, Main Building, Room 1. For information on FERPA-related issues, see <http://registrar.utexas.edu/students/records/ferpa/>.

If you choose anonymity, please email your JDOE number to your instructor so they can post your grades on Canvas.

Privacy in Canvas: Information in Canvas is protected by your UTEID login. Please be aware that I will use a merged Canvas site for all sections of the course that I am teaching this semester. This will allow students in other sections to see that you are enrolled in the course and send you email from within Canvas. However, they will not actually learn your email address and no other personal data will be revealed through Canvas. If you have any concerns, please contact the ITS Help Desk at 475-9400 for help removing your name from view of other students.

Statement on Learning Success:

Your success in this class is important to me. We will all need accommodations because we all learn differently. If there are aspects of this course that prevent you from learning or exclude you, please let me know as soon as possible. Together we'll develop strategies to meet both your needs and the requirements of the course. I also encourage you to reach out to the student resources available through UT. Many are listed on this syllabus, but I am happy to connect you with a person or Center if you would like.

Student Rights & Responsibilities:

- You have a right to a learning environment that supports mental and physical wellness.
- You have a right to respect.
- You have a right to be assessed and graded fairly.
- You have a right to freedom of opinion and expression.
- You have a right to privacy and confidentiality.
- You have a right to meaningful and equal participation, to self-organize groups to improve your learning environment.
- You have a right to learn in an environment that is welcoming to all people. No student shall be isolated, excluded or diminished in any way.

With these rights come responsibilities:

- You are responsible for taking care of yourself, managing your time, and communicating with the teaching team and with others if things start to feel out of control or overwhelming.
- You are responsible for acting in a way that is worthy of respect and always respectful of others.
- Your experience with this course is directly related to the quality of the energy that you bring to it, and your energy shapes the quality of your peers' experiences.
- You are responsible for creating an inclusive environment and for speaking up when someone is excluded.
- You are responsible for holding yourself accountable to these standards, holding each other to these standards, and holding the teaching team accountable as well.

Students with Disabilities:

Students with disabilities may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 512-471-6259, <http://diversity.utexas.edu/disability/>

Diversity and Inclusion

It is my intent that students from all diverse backgrounds and perspectives will be well served by this course, that students' learning needs will be addressed and that the diversity that students bring to this class can be comfortably expressed and be viewed as a resource, strength, and benefit. Please let me know right away if this ever is not the case. Please also make the TAs and me aware if you have a preferred name or pronoun that you would prefer we use as soon as possible.

Religious Holy Days

By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

Policy on Scholastic Dishonesty

The McCombs School of Business has no tolerance for acts of scholastic dishonesty. The responsibilities of both students and faculty with regard to scholastic dishonesty are described in detail in the BBA Program's Statement on Scholastic Dishonesty at <http://my.mcombs.utexas.edu/BBA/Code-of-Ethics>. By teaching this course, I have agreed to observe all faculty responsibilities described there. By enrolling in this class, you have agreed to observe all student responsibilities described there. If the application of the Statement on Scholastic Dishonesty to this class or its assignments is unclear in any way, it is your responsibility to ask me for clarification. Students who violate University rules on scholastic

dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since dishonesty harms the individual, all students, the integrity of the University, and the value of our academic brand, policies on scholastic dishonesty will be strictly enforced. You should refer to the Student Conduct and Academic Integrity website at <http://deanofstudents.utexas.edu/conduct/> to access the official University policies and procedures on scholastic dishonesty as well as further elaboration on what constitutes scholastic dishonesty. **Note, if you violate the policy, you will receive a zero on the assignment you cheated on with no chance to redo the assignment. All infractions are reported to the Dean of Students Academic Integrity Office.**

University of Texas Honor Code

The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the university is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.

Sharing of Course Materials is prohibited

No materials used in this class, including, but not limited to, lecture hand-outs, videos, assessments (quizzes, exams, papers, projects, homework assignments), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class unless you have my explicit, written permission. Unauthorized sharing of materials promotes cheating. It is a violation of the University's Student Honor Code and an act of academic dishonesty. I am well aware of the sites used for sharing materials, and any materials found online that are associated with you, or any suspected unauthorized sharing of materials, will be reported to Student Conduct and Academic Integrity in the Office of the Dean of Students. These reports can result in sanctions, including failure in the course.

Class Recordings

Class recordings are reserved only for students in this class for educational purposes and are protected under FERPA. The recordings should not be shared outside the enrolled students in any form. Violation of this restriction by a student could lead to Student Misconduct proceedings. Guidance on public access to class recordings can be found [here](#).

Drop Policy

University policies permit you to drop this course by the withdraw/drop deadlines set by UT.

Title IX Reporting Disclosure

Title IX is a federal law that protects against sex and gender-based discrimination, sexual harassment, sexual assault, sexual misconduct, dating/domestic violence and stalking at federally funded educational institutions. UT Austin is committed to fostering a learning and working environment free from discrimination in all its forms. When sexual misconduct occurs in our community, the university can:

1. Intervene to prevent harmful behavior from continuing or escalating.
2. Provide support and remedies to students and employees who have experienced harm or have become involved in a Title IX investigation.
3. Investigate and discipline violations of the university's [relevant policies](#).

Beginning January 1, 2020, Texas Senate Bill 212 requires all employees of Texas universities, including faculty, report any information to the Title IX Office regarding sexual harassment,

sexual assault, dating violence and stalking that is disclosed to them. Texas law requires that all employees who witness or receive any information of this type (including, but not limited to, writing assignments, class discussions, or one-on-one conversations) must be reported. **I am a Responsible Employee and must report any Title IX related incidents** that are disclosed in writing, discussion, or one-on-one. Before talking with me, or with any faculty or staff member about a Title IX related incident, be sure to ask whether they are a responsible employee. If you would like to speak with someone who can provide support or remedies without making an official report to the university, please email advocate@austin.utexas.edu. For more information about reporting options and resources, visit <http://www.titleix.utexas.edu/>, contact the Title IX Office via email at titleix@austin.utexas.edu, or call 512-471-0419.

Although graduate teaching and research assistants are not subject to Texas Senate Bill 212, they are still mandatory reporters under Federal Title IX laws and are required to report a wide range of behaviors we refer to as sexual misconduct, including the types of sexual misconduct covered under Texas Senate Bill 212. The Title IX office has developed supportive ways to respond to a survivor and compiled campus resources to support survivors.

McCombs Classroom Professionalism Policy

The highest professional standards are expected of members of the McCombs community. The collective class reputation and the value of the McCombs experience hinges on this. Please let me know right away if this ever is not the case.

Faculty are expected to be professional and prepared to deliver value for each and every class session.

Students are expected to be professional in all respects. Classroom expectations of students include:

- Students will arrive on time.
- Students will be fully prepared for each class.
- Students will attend the class section to which they are registered.
- Students will respect the views and opinions of their colleagues. Disagreement and debate are encouraged. Intolerance for the views of others is unacceptable.
- Phones and wireless devices are turned off unless otherwise instructed by the professor.

Using Email for Official Correspondence to Students

Email is recognized as an official mode of university correspondence. **You are responsible for reading your email for university and course-related information and announcements posted on Canvas or in Piazza.** You are responsible for keeping the university informed about changes to your email address. You should check your email regularly and frequently – I recommend daily, especially the evenings before class – to stay current with university-related communications, some of which may be time-critical. UT Austin's policies and instructions for updating your email address are found at <http://www.utexas.edu/its/policies/emailnotify.php>.

Behavior Concerns Advice Line (BCAL)

If you are worried about someone who is acting differently, you may use the Behavior Concerns Advice Line to discuss your concerns about another individual's behavior. This service is provided through a partnership among the Office of the Dean of Students, the Counseling and Mental Health Center (CMHC), the Employee Assistance Program (EAP), and The UT Police Department (UTPD). Call 512- 232-5050 or visit <http://www.utexas.edu/safety/bcal>.

COVID Caveats

To help keep everyone in this class and in our community safe, it is critical that students report COVID-19 symptoms and testing, regardless of test results, to [University Health Services](#), and faculty and staff report to the [HealthPoint Occupational Health Program](#) (OHP) as soon as possible. Please see this [link](#) to understand what needs to be reported. In addition, to help understand what to do if a fellow student in the class (or the instructor or TA) tests positive for COVID, see this [University Health Services link](#).

Safety and Class Participation/Masks

We will all need to make some adjustments in order to benefit from in-person classroom interactions in a safe and healthy manner. Our best protections against spreading COVID-19 on campus are masks (defined as cloth face coverings) and staying home if you are showing symptoms. Therefore, for the benefit of everyone, this means that all students are required to follow these important rules.

- **Every student must wear a cloth face-covering properly in class and in all campus buildings at all times.**
- **Students are encouraged to participate in documented daily symptom screening.** This means that each class day in which on-campus activities occur, students must upload certification from the symptom tracking app and confirm that they completed their symptom screening for that day to Canvas. Students should not upload the results of that screening, just the certificate that they completed it. If the symptom tracking app recommends that the student isolate rather than coming to class, then students must not return to class until cleared by a medical professional.
- Information regarding [safety protocols with and without symptoms](#) can be [found here](#).

If a student is not wearing a cloth face-covering properly in the classroom (or any UT building), that student must leave the classroom (and building). If the student refuses to wear a cloth face covering, class will be dismissed for the remainder of the period, and the student will be subject to disciplinary action as set forth in the university's Institutional Rules/General Conduct 11-404(a)(3). Students who have a condition that precludes the wearing of a cloth face covering must follow the procedures for [obtaining an accommodation](#) working with [Services for Students with Disabilities](#).

Campus Safety

Please note the following key recommendations regarding emergency evacuation, provided by the Office of Campus Safety and Security. More info at <https://preparedness.utexas.edu/>.

- Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings and assemble outside when a fire alarm is activated.
- Familiarize yourself with all the exits of each classroom and building you may occupy.
- If you need evacuation assistance, inform the instructor in writing asap.
- In the event of an evacuation, follow the instruction of faculty or class instructors.
- Do not re-enter a building unless given instructions by Austin or UT police or fire authorities.

In case of emergency, further information will be available at

<http://www.utexas.edu/emergency>.

University Resources for Students

COVID-19 Update: “Keep Learning” Resources

This course may be offered in a format to which you are unaccustomed. If you are looking for ideas and strategies to help you feel more comfortable participating in our class, please explore the resources available here: <https://onestop.utexas.edu/keep-learning/>

Services for Students with Disabilities

The university is committed to creating an accessible and inclusive learning environment consistent with university policy and federal and state law. Please let me know if you experience any barriers to learning so I can work with you to ensure you have equal opportunity to participate fully in this course. If you are a student with a disability, or think you may have a disability, and need accommodations please contact Services for Students with Disabilities (SSD). Please refer to SSD's website for contact and more information: <http://diversity.utexas.edu/disability/>. If you are already registered with SSD, please deliver your Accommodation Letter to me as early as possible in the semester so we can discuss your approved accommodations and needs in this course.

Counseling and Mental Health Center

The Counseling and Mental Health Center serves UT's diverse campus community by providing high quality, innovative and culturally informed mental health programs and services that enhance and support students' well-being, academic and life goals. To learn more about your counseling and mental health options, call CMHC at (512) 471-3515. If you are experiencing a mental health crisis, call the CMHC Crisis Line 24/7 at (512) 471-2255.

The Sanger Learning Center

Did you know that more than one-third of UT undergraduate students use the Sanger Learning Center each year to improve their academic performance? All students are welcome to take advantage of Sanger Center's classes and workshops, private learning specialist appointments, peer academic coaching, and tutoring for more than 70 courses in 15 different subject areas. For more information, please visit <http://www.utexas.edu/ugs/slcor> call 512-471-3614 (JES A332).

Undergraduate Writing Center: <http://uwc.utexas.edu/>

Libraries: <http://www.lib.utexas.edu/>

ITS: <http://www.utexas.edu/its/>

Student Emergency Services: <http://deanofstudents.utexas.edu/emergency/>

BeVocal

BeVocal is a university-wide initiative to promote the idea that individual Longhorns have the power to prevent high-risk behavior and harm. At UT Austin all Longhorns have the power to intervene and reduce harm. To learn more about BeVocal and how you can help to build a culture of care on campus, go to: <https://wellnessnetwork.utexas.edu/BeVocal>.

Online Class Guidelines

- **Getting help with Zoom:**

Students needing help with Zoom should can refer to the [McCombs Student Instructional Resources Wiki](#). All Canvas webpages for all McCombs courses will have a link to the McCombs Student Instructional Resource Wiki on the bottom left corner.

- **Preferred method of joining a class or office hours in Zoom:**

Join a class or office hours through video on Canvas. Students must log into their Canvas course site and click on Zoom in the left toolbar to locate links to join the class in Zoom.

- **Zoom etiquette:**

Because there will be so many people on these Zoom meetings, here are some best practices for making sure we are working together to create an efficient, effective, respectful, and ultimately enjoyable classroom!

- Turn on your video when you get to class. This helps to preserve a sense of being in class together even while remote.
- Mute yourself unless you are speaking. This will cut down on background noise and limit any distractions
- Be mindful of your surroundings when on camera. We want to make sure we avoid as much distraction as possible
- Please add a professional photo of yourself for your Zoom profile picture. This photo will be visible during class sessions
- Turn your camera off if you are leaving the meeting temporarily and use the away feedback icon
- Try to keep questions and comments brief. With a large classroom, there are many people to get through and many questions to move through. Try to limit remarks as much as possible
- Minimize repetition. If you are hearing repeat info, use the go faster icon.
- If the video or audio is choppy, try turning off your video.
- Please try to use the most reliable WIFI you can access.

- **Class recording privacy:**

Class recordings are reserved only for students in this class for educational purposes. The recordings should not be shared outside the class in any form. Violation of this restriction could lead to Student Misconduct proceedings.

- **Help from Student Emergency Services:**

Students who need help getting access to technology in order to do online instruction should fill out the [Student Emergency Services form](#). For general inquiries, please contact [Student Emergency Services](#).

Tentative Schedule

Changes to the schedule may be made at my discretion and if circumstances require. It is your responsibility to note these changes when announced (although I will do my best to ensure that you receive the changes with as much advance notice as possible). All assignments due dates will be listed on Canvas on the bottom of the **Syllabus** page.

Date	Session	Topics	Details	Assessments
Optional, but encouraged bitcoin community involvement: - Make an basic open source contribution to a bitcoin project - Go to a bitcoin meetup - Austin BitDevs: https://austinbitdevs.com - Austin LitDevs: https://www.meetup.com/austin-lightning-devs - Austin Bitcoin Club: https://www.austinbitcoinclub.com - Austin Bitcoin Design Club: https://abdc.dev				
M1D1	1	Syllabus Walkthrough The history of money The bitcoin whitepaper	• Introduce yourselves • Syllabus walkthrough: how will the class be graded? Q&A • What is money? Why bitcoin? What is bitcoin? • Byzantine general's problem • History of digital money ◦ ecash, bitgold, bmoney, Wei Dai, Nick Szabo, Hal Finney, Adam Back, David Chaum • The whitepaper and a general overview of the nuts and bolts of bitcoin	Download bitcoin core and complete IBD
M1D1	2	Intro to cryptography used in bitcoin BIP 39 wallet demo Bitcoin nodes, CLI, and raw transactions	• Digital Signatures, ECDSA, Hashes, SHA256, Merkel trees • What are blocks, nodes, BIPs, UTXOs, forks, segwit/taproot? • How hardware wallets protect your secrets • How can we attack bitcoin? ◦ Technical ◦ Economic ◦ Social	Community involvement
M2D1	3	Intro to bitcoin script Evolution of standard bitcoin scripts Demo of bitcoin script playground <i>Guest lecture with Super Testnet of Lightning Escrow</i>	• Script Pub Keys • Script Signatures • Witnesses • OP Codes • P2SH • Segwit / P2WPKH / P2WSH • Intro to taproot • Multisignature contracts	Create a bitcoin script (e.g. a multisig that decays over time in bitcoin script)
M2D2	4	Bitcoin smart contracting Oracles Discreet Log Contracts	• Different ways to do oracles • Discreet Log Contracts ◦ DLC Oracles ◦ Wallets ◦ Contract types • Smart Contracts Unchained ◦ Escrows • Taproot	Install LND or Core Lightning, open at least one channel, and join PLEBNET

Date	Session	Topics	Details	Assessments
Optional, but encouraged bitcoin community involvement: - Make an basic open source contribution to a bitcoin project - Go to a bitcoin meetup - Austin BitDevs: https://austinbitdevs.com - Austin LitDevs: https://www.meetup.com/austin-lightning-devs - Austin Bitcoin Club: https://www.austinbitcoinclub.com - Austin Bitcoin Design Club: https://abdc.dev				
		Taproot + Smart Contracts	- o MAST - o Schnorr - o Versioning	
M3D1	5	Bitcoin Forks / Upgrades Scaling Wars Lightning demo Intro to Lightning	• Consensus • Hard Fork vs Soft Fork • Activation Processes • Segwit2x vs UASF • Playing with Lightning!! • Basics of Lightning - o BOLTS - o Payment Channels - o Routing payments - o Security of Lightning	Work on projects
M3D2	6	Lightning Deep Dive Panel of industry experts on Lightning and other scaling solutions Introduce final projects <i>Guest lecture TBA</i>	• Lightning Deep Dive - o Channel Updates - o Feature Bits - o Route Blinding - o Trampoline Payments - o Splicing - o Taproot - o Eltoo • Scaling bitcoin panel • Introduction to final project - o Enumerate different ideas that we came up with	Work on projects
M4D1	7	Bitcoin libraries Lab time Different wallet backends <i>Guest lecture with Lisa Neigut of Base58 and Blockstream</i>	• Bitcoin libraries & their capabilities • How to: - o generate address - o sign tx - o broadcast tx • Full node vs lite node • Neutrino • Bloom filter • Electrum	Work on projects
M4D2	8	Standard Bitcoin RPC interfaces Lab time <i>Guest panel with Pleb Lab, the Austin bitcoin startup accelerator</i>	• Bitcoin RPC interfaces - o bitcoind - o btcd - o Ind/cln/eclair/sensei - o LndHub • What is it like working in bitcoin • Starting a bitcoin business • Bitcoin business models • Business & open source	Work on projects

Date	Session	Topics	Details	Assessments
Optional, but encouraged bitcoin community involvement: - Make an basic open source contribution to a bitcoin project - Go to a bitcoin meetup - Austin BitDevs: https://austinbitdevs.com - Austin LitDevs: https://www.meetup.com/austin-lightning-devs - Austin Bitcoin Club: https://www.austinbitcoinclub.com - Austin Bitcoin Design Club: https://abdc.dev				
M5D1	9	Bitcoin Privacy Technology Privacy Networks Lab Time <i>Guest Bitcoin Design Panel</i>	• Bitcoin Privacy ◦ Footguns ◦ CoinJoin ◦ Payjoin ◦ Mixers • Privacy Soft forks • Lightning Privacy • Tor • I2P • Helping users understand bitcoin • What makes a wallet good	Work on projects
M5D2	10	Team Presentations and Demos BitDevs Socratic Seminar RBF Ball Game	• Teams will present their project • Try to break each other's projects • Socratic Seminar over latest bitcoin tech with Benthecarman from The Bitcoin Company and Buck from Unchained Capital	Become a bitcoin developer :)