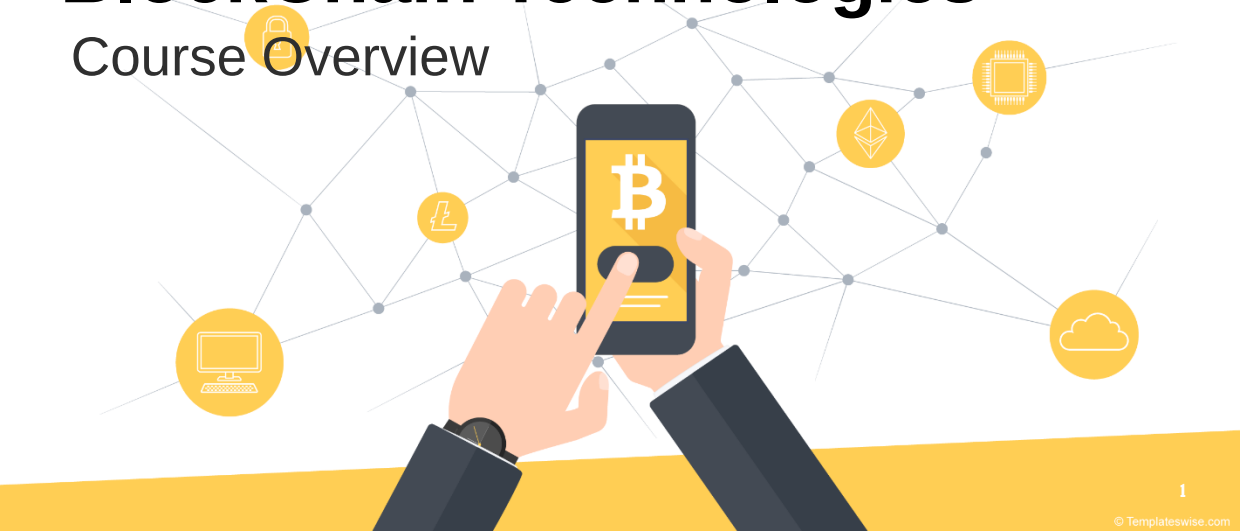
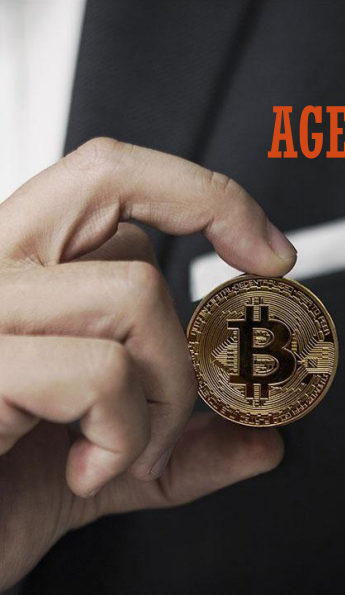
BlockChain Technologies

Course Overview



AGENDA



01 Course Information

02 Course Load

03 Goals

04 Syllabus

WHY SHOULD WE STUDY BLOCKCHAIN?

- There's a shortage of knowledgeable people in the field.
  - This is true for most emerging technologies, **but the cryptocurrency space is unique.**

- Many blockchain projects will have tremendous social/economical impact
  - https://blockchainforsocialimpact.com/

- Technology Trends of 2021 by Gartner:
  1. Cloud computing
  2. **Blockchain**
  3. Internet of Things
  4. Artificial Intelligence

WHAT IS A BLOCKCHAIN?

Abstract answer: a blockchain provides
coordination between many parties,
when there is no single trusted party

if trusted party exists ⇒ no need for a blockchain

[financial systems: often no trusted party]

BLOCKCHAINS: WHAT IS THE NEW IDEA?

2009

Bitcoin

Several innovations:

- A practical **public append-only data structure**, secured by replication and incentives

BLOCKCHAINS: WHAT IS THE NEW IDEA?

GOALS

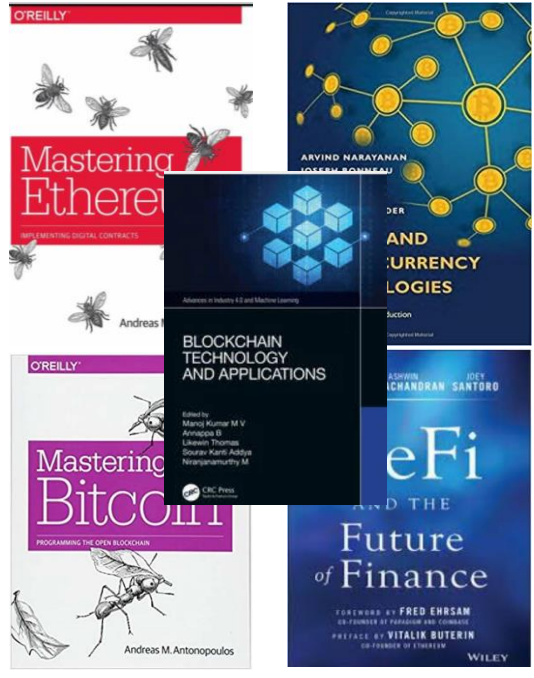
- Learn about the cryptographic foundations for blockchain and cryptocurrencies.
- Comprehend blockchain challenges of distribution, consensus, and theoretical and practical attacks.
- Learn the topics related to confidentiality in the block chain and the methods of providing it.
- Understand how cryptocurrencies work and the ideas, technologies, and organizations sprouting from it.
- Get familiar with the economic, financial and social aspects of cryptocurrencies.
- Blockchain applications in many cases, including electronic markets, smart contracts, distributed economy, and distributed organizations.
- Learn how to design, code, and deploy smart contracts and decentralized application.

COURSE INFORMATION

- Lecturer: Maedeh Mosharraf
  - Emails: m_mosharraf@sbu.ac.ir
- Chief TA: Parsa Noori
  - Email: parsanoori79@gmail.com
- Telegram group
  - https://t.me/+MWLPODE8UXA3MGVk
- Prerequisite:
  - Basic familiarity with computer programming

TEXTBOOK

- A. Narayanan, J. Bonneau, E. Felten, A. Miller & S. Goldfeder, ***Bitcoin and Cryptocurrency Technologies– A Comprehensive Introduction***, Princeton University Press, 2016.
- A. M. Antonopoulos, ***Mastering Bitcoin: Programming the open blockchain***, O'Reilly Media, 2017.
- A. M. Antonopoulos, ***Mastering Ethereum: Building Smart Contracts and Dapps***, O'Reilly Media, 2018.
- C.R. Harvey, ***DeFi and the Future of Finance,*** Wiley, 2021.
- M. Kumar, et al. ***Blockchain Technology and Applications***, Taylor and Francis Group, 2023.

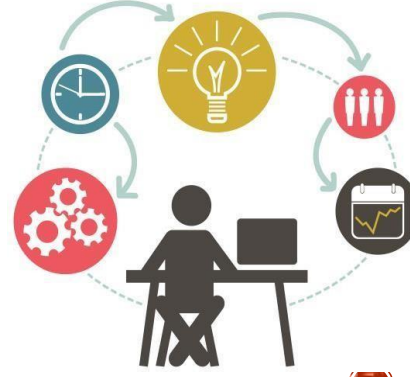


FURTHER READINGS

- D. Yaga, et al., **Blockchain Technology Overview, NIST Draft** NISTIR 8202, January 2018, available on https://csrc.nist.gov.
- S. Li, et al., **PolyShard: Coded Sharding Achieves Linearly Scaling Efficiency and Security Simultaneously**, in IEEE Transactions on Information Forensics and Security, vol. 16, pp. 249-261, 2021.
- E. Shi, **Foundations of Distributed Consensus and Blockchains**. Book manuscript, 2020. Available at https://www.distributedconsensus.net.
- A. Dembo, et al., **Everything is a Race and Nakamoto Always Wins**, Proceedings of the ACM SIGSAC Conference on Computer and Communications Security, USA, 2020.
- G. Fanti, et al., **Compounding of Wealth in Proof-of-Stake Cryptocurrencies**. International Conference on Financial Cryptography and Data Security, Nieuwpoort, 2018.
- M. Mita, et al., **What is Stable coin? A Survey on Its Mechanism and Potential as Decentralized Payment Systems**, International Journal Series International Institute of Applied Informatics, vol. 1, pp. 48 – 63, 2015.
- S. M. Hosseini Bamakan, et al., **A survey of blockchain consensus algorithms performance evaluation criteria**, Expert Systems with Applications, Vol. 154, 2020

COURSE LOAD

- **Final Exam (50%)**
- **Paper reading, homework and computer assignments (30%)**
  - Late submission penalty: -10% a day
- **Project (20%)**
  - Late submission penalty: -10% a day



YOUR PROJECT

- Proposal
  - on Friday, Mehr 21.
- Progress report 1 (Literature review)
  - on Friday, Aban 19.
- Progress report 2 (Feasibility study +Technical details of your project)
  - on Friday, Azar 17.
- Final (Implementation and Deployment)
  - on Friday, Dey 15.