

Blockchain and its application in finance

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Course description

The aim of the course is to explore the essence of the cryptoeconomics and Decentralized Finance. The course is divided into 7 big chapters covering the important milestone of the cryptoeconomy. The story begins with the blockchain fundamentals and cryptography. The following part will be devoted to the BTC, ETH and Early ecosystems as well as centralized exchanges and trading. In the following chapter DeFi is introduced with the deep dive into AMMs. Stablecoins and DAOs are in the spotlight after intro to DeFi and the course is finalized by the NFT chapter about Ownership and Creator Economy.

Course requirements, grading, and attendance policies

The course has no specific prerequisites.

Grading:

- Homework #1 (15%)
- Homework #2 (15%)
- Final project (70%)

Course contents

- Class 1: Fundamentals of cryptoeconomics.
 - The issue of scaling in the environment with asymmetry of information.
 - Basics of cryptoeconomics. Historical context of ICO boom.
 - CEX: infrastructure, business analytics, wash trading, market making, instruments.
 - Stablecoins: fiat-backed USDT, USDC. Revenue model, risks and technical infrastructure.
- Class 2: Blockchain fundamentals:
 - Cryptography basics: Hash function, elliptic curves, digital signature
 - Distributed ledger technology: blocks, transactions, producers
 - Essential issues of DLT
- Class 3: Operations in blockchain: Bitcoin and Ethereum
 - Consensus: PoW, PoS, DPoS, PoA
 - Bitcoin transactions, UTXO-model
 - Ethereum smart contracts: logics and applications
- Class 4-5: Economic Models, Infrastructure, Decentralized Finance (DeFi) introduction:

- PoW, PoS L1s and L2 rollups economic models
 - Centralized exchanges
 - Financial infrastructure for retail and institutional grade applications: wallets, multisignature wallets, custody, prime brokerage, staking providers. Custodial vs. non-custodial approach
 - DeFi Intro: theory, concepts, history 2015-2021, MakerDAO, Synthetix, Compound
 - Stablecoins: fiat-backed, overcollateralized, algorithmic, elastic, mixed, CBDCs, regulation.
 - AMM: theory, constant product market, curves, impermanent loss, LP returns modeling, Balancer, Uniswap, Curve, KyberSwap, Bancor, DMM, flash loans.
 - Lending Protocols: Compound, Aave. interest rate curve, liquidity dynamics, structure of oracles and risk management. Fixed rate lending.
 - Insurance protocols: Nexus Mutual, Unslashed Finance. Pricing policy, smart contract risk evaluation, risk-modeling and capital allocation.
 - Asset Management: Yearn Finance. Revenue model, risk management and strategy execution.
 - Derivatives: dYdX, Perp Protocol, Oryn. Instruments, risks, pricing policy and business model.
 - DeFi Servicing protocols: Gelato, Keep3r. Revenue model, the way operate and target market.
 - Other protocols.
- Class 6: Decentralized management: DAO. Valuation of tokens and other cryptoassets and advanced topics:
 - DAO: the essentials, how to operate and how to grow, yield farming, liquidity mining, governance tokens, LAO and regulation.
 - Valuation approaches
 - Advanced topics: scalability trilemma, multichain vs. cross-chain, bridges, networks comparison, modeling of economic security of blockchains, smart-contract risks, MEV.
 - Class 7: DeFi and Digital Economy
 - Digital Economy and Web 3.0
 - Tokenization of digital rights: NFTs

Course materials

All materials will be provided during lectures.

Academic integrity policy

Cheating, plagiarism, and any other violations of academic ethics at NES are not tolerated.