

Blockchain and Cryptocurrency

1. **Course number and name:** 020BLOES3 Blockchain and Cryptocurrency

2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours

3. **Name of course coordinator:** Said Nassar

4. **Instructional materials:** Course handouts; slides

5. **Specific course information**

a. **Catalog description:**

The Blockchain Technology course offers a comprehensive foundation in blockchain systems, cryptocurrencies, decentralized applications (DApps), and consensus mechanisms. It blends theoretical concepts with hands-on experience to equip students with practical skills relevant to blockchain development and application. Students will explore core cryptographic principles, blockchain structure, smart contracts, and real-world use cases in finance, supply chain, and more.

b. **Prerequisites:** None

c. **Selected Elective** for CCE students

6. **Educational objectives for the course**

a. **Specific outcomes of instruction:**

Understand the historical context and need for blockchain technologies

- Apply basic cryptographic techniques relevant to data integrity and blockchain security
- Explain blockchain architecture, consensus mechanisms, and major protocols
- Manage wallets, transactions, and apply smart contracts
- Analyze and compare blockchain applications across different industries
- Evaluate advanced topics such as NFTs, DeFi, and blockchain scalability

b. **PI addressed by the course:**

PI	1.1	1.2	1.3	2.3	7.1
Covered	x	x	x	x	x
Assessed			x		

7. **Brief list of topics to be covered**

- Introduction to blockchain, the history of money, and the need for decentralization (2 lectures)
- Cryptographic foundations: hash functions, digital signatures, and public/private key encryption (2 lectures)
- Blockchain architecture: blocks, transactions, chains, and decentralization (2)

- Bitcoin protocol, network fundamentals, and Proof of Work consensus (2 lectures)
- Wallet types, address generation, transaction creation and verification (2 lectures)
- Ethereum platform, the EVM, and smart contract development in Solidity (2 lectures)
- Advanced transaction types: multi-signature, time-locks, privacy, and efficiency (2 lectures)
- Consensus mechanisms: Proof of Stake, Proof of History, and comparative models (2 lectures)
- Decentralized applications (DApps) in various sectors (2 lectures)
- NFTs and tokenization: standards, asset ownership, and applications (2 lectures)
- Cryptocurrency markets, trading strategies, and blockchain scalability solutions (2 lectures)
- Applications of blockchain in industry, and discussion on security, ethics, and regulations (2 lectures)