UNIVERSITY of NICOSIA

Course Syllabus

Course Code	Course Title	ECTS Credits
BLOC-511DL	Digital Currency	10
Prerequisites	**Department**	**Semester**
N/A	Digital Innovation	Fall / Spring
Type of Course	**Field**	**Language of Instruction**
Required	Distributed Ledger Technology, Blockchain	English
Level of Course	**Lecturer(s)**	**Year of Study**
2nd Cycle	Dr. George Giaglis Industry Fellows: Antonis Polemitis, Andreas Antonopoulos	1st
Mode of Delivery	**Work Placement**	**Corequisites**
Distance Learning	N/A	N/A

Course Objectives:

This course aims to provide a comprehensive understanding of money's historical evolution, blockchain technology, and cryptocurrencies, including Bitcoin and Ethereum. It explores the fundamentals of decentralized finance (DeFi) and stablecoins, delving into advanced topics in Bitcoin and Ethereum, and examining the convergence of blockchain with other exponential technologies. Additionally, it equips students with practical knowledge on wallet security and interacting with decentralized applications.

Learning Outcomes:

After completion of the course students are expected to be able to:

- Be able to describe the Byzantine Generals' Problem (a classical problem on how to achieve a single winning strategy involving various parties, some of which may be corrupted, untrusted, or may disseminate inaccurate information) and how do blockchains address this problem.
- Understand the basics of blockchain technology, i.e. cryptographic functions (hashes), the process of mining and issuance of new currency, various consensus mechanisms including the 'Proof-of-Work' consensus mechanism used in the Bitcoin Blockchain.

- Understand how blockchain technology creates trust among untrusted parties and immutable entries, by linking/chaining blocks of information together (thus the concept of 'blockchain').
- Learn how to transact and store cryptocurrencies, look-up and dissect real transactions in open blockchain networks.
- Dive-in to more technical aspects of the technology including the cryptographic principles by which digital currencies operate, forks and blockchain scaling.
- Learn why this is an innovative technology and understand its potential to disrupt a number of other industries.
- Identify some of the industries that may be disrupted by this technology, such as financial institutions, health, real estate, supply chain, academia, and others, as well as describe blockchain-related use cases.
- Understand other advanced uses of the blockchain such as escrow services, asset registration, attestation, smart contracts, digital assets, tokenization, CBDCs, DeFi and others.
- Evaluate how central banks or governments may issue their own digital currency, for what purposes and to what end.
- Explore the current mega-trends towards decentralization and how blockchain and other technologies, such as AI and the IoT, fuel these trends.

Course Content:

Main Topic/Thematic Areas

Session 1: A Brief History of Money
•Overview of money's historical evolution from barter to modern forms.
•Examination of money's properties and their impact over time.
•Framing Bitcoin in the context of money.

Session 2: Fundamentals of Blockchains
•Evolution of ledger systems from single-entry to double-entry.
•Analysis of weaknesses in centralized ledgers.
•Explanation of Bitcoin's blockchain, Proof-of-Work, and Bitcoin Mining.

Session 3: Fundamentals of Cryptocurrencies
•Exploration of Bitcoin's cryptographic foundations.
•Introduction to consensus mechanisms, focusing on Proof-of-Work.
•Detailed explanation of Bitcoin Mining.

Session 4: Programmable Blockchains

•Discussion of the blockchain trilemma and Turing-complete blockchains.
•Overview of smart contracts, dApps, and tokenomics.
•Insight into alternative consensus mechanisms and Ethereum's development.

Session 5: Decentralized Finance (DeFi)
•Analysis of limitations in traditional finance and introduction to DeFi.
•Exploration of DeFi's characteristics and technological stack.
•Examination of decentralized lending, borrowing, and exchanges in DeFi.

Session 6: Wallet Security and Transactions
•In-depth guide on establishing hot and cold wallets.
•Best security practices for wallet management.
•Step-by-step instructions for executing transactions.

Session 7: Advanced Topics in Bitcoin
•Analysis of blockchain upgrades, social consensus, and forks.
•Exploration of multisignature transactions and Bitcoin extensions.
•Introduction to solutions like Counterparty and the Liquid Network.

Session 8: Advanced Topics in Ethereum and Programmable Blockchains
•Exploration of the blockchain trilemma's impact on Ethereum.
•Analysis of Layer 1 and Layer 2 solutions for scalability.
•Comparative study of different scalability solutions.

Session 9: Stable Digital Currencies
•Examination of stablecoins as a solution to cryptocurrency limitations.
•Introduction to Central Bank Digital Currencies (CBDCs) and their design.
•Analysis of programmability and financial implications of CBDCs.

Session 10: Blockchain and Decentralization
•Reassessment of the need for transitioning to decentralized systems.
•Forecast of a decentralized future and phases of transition.
•Contextualization of blockchain and decentralization in global issues.

Session 11: Convergence of Blockchain with Exponential Technologies
•Exploration of blockchain's integration with AI and IoT.
•Analysis of decentralized AI and IoT benefits.
•Discussion on blockchain's role in driving technological synergy.

Session 12: Interacting with Decentralized Apps

•In-depth guide on interacting with decentralized applications.
•Best practices for using DeFi applications and other dApps.

Learning Activities and Teaching Methods:

Teaching materials include presentations with extended descriptions and explanations, additional readings (journal articles and e-books), access to additional videos related to the course, forums, chats, and practice quizzes.

Assessment Methods:

Formative Assessments

•   Interactive quizzes that offer feedback and explanations for the correct response.

Summative Assessments

•   12 interactive graded activities that contribute to 40% of the course's total.

▪   Final essay-based exam contributing 60% to the course's total.

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
"Mastering Bitcoin: Programming the Open Blockchain". 3rd Edition.	Andreas M. Antonopoulos	O.Reily media	2024	
"Mastering Ethereum: Building Smart Contracts and DApps". 2nd Edition	Andreas M. Antonopoulos	O.Reily media	2024	

Additional:
- Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks / The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology / Blockchain: Blueprint for a New Economy (good info on IoT, Machine economy etc)

Additional material:
- Up-to-date academic papers provided to students along with presentationsCurrency and Blockchain Technologies constitute recent and rapidly evolving disciplines.