Blockchain Technologies

Evaluate blockchain's impact in modern business environments

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Discover how emerging technologies are transforming business operations and creating a competitive advantage.

This module teaches the fundamentals of blockchain, including distributed ledgers, decentralisation, cryptocurrencies, and dApps. You'll explore the ethical and legal aspects of blockchain technology and see how businesses can harness it for strategic gain.

By the end of the module, you will be equipped to use blockchain effectively in business contexts.

Learning objectives

This module guides students through the understanding and evaluation of blockchain's impact on modern business. It covers blockchain essentials like distributed ledgers, decentralisation, cryptocurrencies and dApps. Ethical and legal considerations are also addressed, highlighting how blockchain offers a competitive edge.

By the end of the course, students will be able to:

Understand and evaluate blockchain technologies and their impact on financial systems, including key components and new use cases.

Compare different blockchain protocols, considering ethical, legal, and practical challenges to predict future developments.

Design and build a blockchain application, assessing its infrastructure and suitability in various contexts.

Plan blockchain integration in businesses, combining technology and regulatory knowledge to take advantage of new opportunities.

Criteria — are you eligible?

- **Language proficiency:** Minimum C1 English proficiency, plus 2 years' work or education in an English-speaking environment. IELTS: 6.0; TOEFL PBT: 600; TOEFL CBT: 200; TOEFL iBT: 100

- **Education:** Relevant EQF Level 6 qualification required (eg STEM, economics). Without this you will have an interview and assessment to evaluate certifications, qualifications or professional experience.
  EQF levels explained

- **Residency:** This EU-funded programme is open to all EU nationals with a passport or valid ID from one of the 27 EU countries.

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New digital opportunities for D4B students

This module is suited to professionals, academics and industry figures interested in blockchain technology and its transformative applications.

Ideal for careers in blockchain development, financial technology data analysis and cybersecurity, it equips learners to become blockchain consultants, compliance officers, and innovation managers.

Embrace a new era of innovative digital learning

Teaching is fully online and includes hybrid learning with both live (synchronous) and self-paced (asynchronous) activities. Expert tutors support students throughout the course. Learning involves live lectures, self-study, and hands-on labs.

Methods like problem-based learning, gamification and flipped classrooms are used, leveraging technologies like artificial intelligence. Progress is measured through ongoing and final assessments, including a project (50%) and a final test (50%).

Time commitment

- Classroom and demonstrations: 24 hours
- Practical work/tutorials: 24 hours
- Independent learning: 77 hours
- Total: 125 hours

Credit points

- 10 ECTS

Full course content

Subjects covered

Blockchain Technologies is a 5 ECTS module delivered over four hours per week for 12 weeks. The schedule of topics to be addressed each week is outlined below:

- **Introduction**
  - Introduction to Blockchain and Cryptocurrency
  - Historical Context of Blockchain and Cryptocurrencies
  - Overview of Different Blockchain Types
  - Introduction to the Blockchain Stack and its Core Components

- **Blockchain Stack and Core Components**
  - In-depth Discussion on Web3 and Technological Fundamentals
  - Detailed Analysis of Block Composition and Consensus Mechanisms (POET/ POB/ POS/ POW)
  - Basics of Distributed Systems and Distributed Ledger Technology (DLT)
  - Cryptographic Foundations: Hashing and the Merkle Tree

- **Blockchain Management**
  - Principles of Decentralisation and Brewer's CAP Theorem
  - Examination of Public, Private, and Enterprise Blockchains
  - Business Case Development for Blockchain Applicatios

- **Cryptocurrencies and the Blockchain**
  - Handling Cryptocurrencies: Storage, Use, and Wallets
  - Exploration of Altcoins and Mining Processes
  - Overview of Recent Trends and Developments in the Cryptocurrency Space

- **Evolution of Blockchain**
  - Detailed Study on the Evolution and Revolution of Blockchain: From Bitcoin to Hyperledger
  - Discussion on Enterprise Blockchain, Digital Identities, and Current Use Cases

- **Security, Identity & Cryptography in Blockchain**
  - The CIA Triad in Blockchain: Confidentiality, Integrity, Authentication
  - Exploration of Symmetric and Asymmetric Encryption, Non-Repudiation, and Public/ Private Keys
  - Hash Functions, Digital Signatures, Anonymity, and the Concept of Self-Sovereign Identity (SSI)

- **Blockchain Applications I - Bitcoin**
  - Comprehensive Overview of the Bitcoin System and Stack
  - Examination of Bitcoin Transactions, the P2P Network, and the Mining Process
  - Consensus Mechanisms: Proof of Work (POW)

- **Blockchain Applications II - Ethereum**
  - Comprehensive Overview of the Ethereum System
  - Smart Contracts, Decentralized Applications (DApps), and the Ethereum Virtual Machine (EVM)
  - Introduction to DAOs, Decentralized Finance (DeFi), and NFTs

- **DApp Development I**
  - Introduction to DApp Development Environments and the Web3 Stack
  - Basics of NodeJS and Express in the Context of Blockchain

- **DApp Development II**
  - Advanced Tools for DApp Development: Infura, RemixIDE, ERC Smart Contracts
  - Practical Use of Ganache, Truffle, and Blockchain APIs

- **Legal & Ethical Aspects of Blockchain**
  - Discussion on the Regulatory Landscape for Cryptocurrencies and Tokens
  - Anti-Money Laundering (AML), Counter-Terrorist Financing (CTF), Know Your Customer (KYC), and Know Your Transaction (KYT) Requirements
  - Ethical Considerations and Ongoing Legal Dynamics

- **Emerging Topics in Blockchain**
  - Exploration of Current Research Directions and Emerging Topics: CBDCs, Privacy, the Metaverse, and Quantum Computing's Impact on Blockchain