

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:

Critically assess blockchain technologies and their revolutionary impact on financial systems, integrating analysis of core components and pioneering use cases.

Analyse and differentiate

between blockchain protocols, addressing ethical, legal, and practical adoption challenges, to foresee the technology's evolving landscape.

Develop communication skills by presenting blockchain-based business solutions to stakeholders with varying levels of technical knowledge. **Collaborate effectively** within multidisciplinary teams to design and implement a blockchain application, employing critical analysis to evaluate its infrastructure and applicability within various contexts.

Strategise blockchain integration within enterprises, synthesising technological and regulatory insights to navigate and leverage emerging opportunities.

Criteria — are you eligible?

- Language proficiency: Minimum B2 English proficiency, or 2 years' work or education in an English-speaking environment. IELTS: 6.0; TOEFL PBT: 600; TOEFL CBT: 200; TOEFL iBT: 100. Alternatively, proficiency may be assessed via a test or interview.
- Education: Relevant EQF Level 6 qualification required in a relevant field including but not limited to: computer science, IT, engineering, maths, business, or economics. Without this you will have an interview and assessment to evaluate certifications, qualifications or professional experience.
 <u>*EQF levels explained</u>
- Residency: This EU co-funded programme is open to all <u>EU27</u>, EEA, UK and Ukrainian nationals with a passport or valid ID from one of these countries.

Blockchain Technologies

New digital opportunities for D4B students

This module equips professionals and graduates with critical skills in blockchain strategy, design, and deployment. Covering protocols, DApps, smart contracts, and DeFi, it prepares learners for roles in fintech, cybersecurity, and beyond.

Graduates will evaluate blockchain's technical, legal, and ethical implications for businesses from SMEs to global enterprises.



Embrace a new era of innovative digital learning

Teaching is fully online and includes 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

5 ECTS

Full course content

Blockchain Technologies is a 5 ECTS module delivered over four hours per week for 12 weeks — 2 hours of live, class time and 2 hours asynchronous content to be done in the student's own time. Schedule 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 Applications

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



Thank You!

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