# Work4Ce Module 02 – Digital Technologies

# Course: BLOCKCHAIN

# *This syllabus is a product of the Work4Ce project M02 Digital Technologies developed by the Academy of the State Customs Committee of the State Customs Committee of the Republic of Azerbaijan (ASCCA). The syllabus updates the curriculum of the ASCCA BA degree programme International Trade and Logistics.*

**Academic Syllabus**

**Course Title:** Blockchain

**Course Code:** İFPS-B11

**Credit Hours:** 5

**Level:** Undergraduate

**Instructor:** Elvin Alirzayev, PhD

**Contact Information:** elvin.alirzayev@ascca.edu.az

**Office Hours:** Each Monday at 12:00 thru 14:00

**Course Description:** This course provides an in-depth introduction to blockchain technology, exploring its architecture, applications, and implications across various industries. Students will gain hands-on experience with blockchain platforms and develop the skills necessary to design and evaluate blockchain-based solutions. Students will also analyze how blockchain improves transparency, efficiency, and security in global supply chains and trade finance. Topics will include cryptocurrency integration, digital trade documentation, and the role of smart contracts in facilitating cross-border transactions.

**Course Objectives:**

1. Understand the fundamentals of blockchain technology and its core components.
2. Analyze real-world applications of blockchain across sectors, particularly in financial markets, trade finance and payments.
3. Develop the ability to critically assess the advantages and limitations of blockchain.
4. Gain practical experience with blockchain platforms and smart contract development.
5. Explore blockchain's role in digitalizing trade documentation and customs processes.

**Learning Outcomes:** Upon successful completion of the course, students will be able to:

1. Explain blockchain architecture and consensus mechanisms.
2. Explore the use of cryptocurrencies and decentralized finance (DeFi).
3. Demonstrate proficiency in blockchain programming and smart contracts.
4. Evaluate the potential of blockchain in solving business and societal challenges.
5. Investigate the impact of blockchain on industries such as supply chain, finance, and government services.
6. Evaluate blockchain-based solutions for logistics and supply chain challenges.

**Grading Breakdown:**

* **Final Exam:** 50 points
* **Midterm Exam:** 20 points
* **Assignments:** 10 points
* **Attendance and Participation:** 10 points
* **Total:** 100 points

**Class Policies**

* Attendance: Students must attend at least 75% of classes to pass.
* Late Submission: Assignments submitted late will incur a penalty unless prior arrangements are made.
* Academic Integrity: Plagiarism or cheating will result in disciplinary action.

**Weekly Topics and Schedule:**

**Week 1:** Introduction to Blockchain Technology
Overview of blockchain history, key concepts, and applications.

* History and Evolution of Blockchain
* Key Concepts: Decentralization, Ledger, and Cryptography

**Week 2:** Blockchain Architecture
Components of a blockchain: blocks, nodes, ledgers, and consensus mechanisms.

* Blocks, Transactions, and Merkle Trees
* Hash Functions and Public-Private Key Cryptography

**Week 3:** Cryptography and Security
Public and private keys, hashing, digital signatures, and cryptographic algorithms.

* Essential cryptographic principles and their significance in ensuring security and trust in international trade and logistics systems.
* Symmetric vs. Asymmetric Cryptography: Overview and distinctions.
* Relevance of cryptography in secure trade transactions and logistics networks.

**Week 4:** Consensus Mechanisms
Proof of Work (PoW), Proof of Stake (PoS), and emerging consensus protocols.

* Proof of Work (PoW), Proof of Stake (PoS), and Variants
* Practical Byzantine Fault Tolerance (PBFT)

**Week 5:** Smart Contracts and Decentralized Applications (DApps)
Introduction to smart contracts and their role in automating processes.

* Definition and Use Cases
* Introduction to Solidity and Ethereum Virtual Machine
* Blockchain-Based Trade Documentation (Bill of Lading, Letters of Credit)

**Week 6:** Blockchain Platforms
Ethereum, Hyperledger, and other prominent blockchain platforms.

* Supply Chain Management
* Economics and Finance

**Week 7:** Midterm Exam
Covers Weeks 1–6 content.

**Week 8:** Real-World Blockchain Applications
Case studies in finance, supply chain, healthcare, and public administration.

Case Studies: Maersk and IBM’s TradeLens

**Week 9:** Blockchain Development Tools
Hands-on experience with development tools and programming languages (e.g., Solidity).

* Categories of tools: Frameworks, programming languages, testing tools, and APIs.
* Overview of the Ethereum platform and its smart contract capabilities.

**Week 10:** Cryptocurrencies in International Trade

* Overview of Cryptocurrencies (Bitcoin, Ethereum, Stablecoins)
* Cross-Border Payments and Trade Finance Applications

**Week 11:** Ethical and Regulatory Issues
Legal frameworks, privacy concerns, and societal impact.

**Week 12:** Blockchain in Emerging Technologies
Integration with IoT, AI, and Big Data.

* Application on Customs Services.
* Enhancing Efficiency and Reducing Fraud in Customs Operations
* Use Cases in Trade Facilitation and Compliance

**Week 13:** Challenges and Future Trends

* Legal and Regulatory Issues in Blockchain Adoption
* Emerging Trends: Central Bank Digital Currencies (CBDCs) and DeFi in Trade

**Week 14:** Final Project Workshop
Guided session to work on the final project.

**Week 15:** Presentation and Review
Student presentations and course wrap-up. Comprehensive evaluation of all topics covered.

**Week 15:** Final Exam

**Assignments** (10 points): A project or report related to blockchain applications. Assignments will involve theoretical questions and practical exercises related to blockchain implementation and evaluation.

**Attendance and Participation** (10 points): Active involvement in discussions and regular attendance. Active participation in lectures, discussions, and workshops is crucial for success in this course.

**Required Textbook:**

* Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System.
* Mougayar, W. (2016). The Business Blockchain.
* Makoto Yano, Chris Dai, Kenichi Masuda, Yoshio Kishimoto (Editors) Blockchain and Crypt Currency: Building a High-Quality Marketplace for Crypt Data, 2020, Japan. <https://doi.org/10.1007/978-981-15-3376-1>
* WORLD BANK, Cryptocurrencies and Blockchain, 2018, Office of the Chief Economist. <https://documents1.worldbank.org/curated/en/293821525702130886/pdf/Cryptocurrencies-and-blockchain.pdf>
* EU, Blockchain and crypto assets**,** <https://www.eiopa.europa.eu/browse/digitalisation-and-financial-innovation/blockchain-and-crypto-assets_en>
* World Economic Forum: *Blockchain for Supply Chains.* Inclusive Deployment of Blockchain for Supply Chains, 2019 <https://www.weforum.org/publications/inclusive-deployment-of-blockchain-for-supply-chains-part-1-introduction/>

**Recommended Reading and Resources**

* WEF, From source to stomach: How blockchain tracks food across the supply chain and saves lives, Aug 12, 2024. <https://www.weforum.org/stories/2024/08/blockchain-food-supply-chain/>
* IBM and Maersk: *TradeLens White Paper*
* OECD: *Blockchain for Trade and Logistics*
* Online resources and academic papers provided during the course.

**Additional Resources:**

1. Online tutorials and documentation on blockchain platforms.
2. Research papers and case studies on blockchain applications.
3. Industry reports and whitepapers.

**Academic Integrity:** Students are expected to adhere to the institution’s policies on academic honesty and integrity. Plagiarism or cheating in any form will not be tolerated.

**Course Policies:**

1. Late submissions for assignments will incur penalties unless prior approval is granted.
2. Attendance is mandatory; students missing more than [Insert Number] classes without valid reasons will lose attendance points.
3. Electronic devices are allowed only for course-related activities during class sessions.

**Final Notes:** This syllabus is tailored for Blockchain course taught to International Trade and Logistics bachelor program and is subject to change with prior notice. Students are encouraged to regularly check the course portal for updates and announcements.