



## **Blockchain Certified Developers Course**

### **Course Overview:**

This course aims to provide university students with a comprehensive understanding of blockchain technology, its underlying principles, and its diverse applications across various industries. Through a combination of theoretical knowledge and practical exercises, students will develop the necessary skills to analyse, design, and implement blockchain solutions.

### **Course Duration: 3 semesters (9 months)**

### **Course Objectives:**

- Understand the fundamental concepts of blockchain technology.
- Explore the different types of blockchain networks and their architectural models.
- Study the cryptography techniques employed in blockchain systems.
- Examine the consensus mechanisms used in blockchain networks.
- Analyse the security and privacy challenges associated with blockchain technology.
- Investigate smart contracts and their applications.
- Explore decentralised applications (DApps) and their development.
- Study real-world use cases of blockchain in industries such as finance, supply chain, healthcare, and more.
- Gain hands-on experience in building and deploying blockchain solutions.
- Evaluate the potential impact of blockchain on society, economics, and governance.
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### **Course Outline:**

#### **1. Introduction to Blockchain Technology (1 weeks)**

- What is blockchain?
- History and evolution of blockchain
- The need for web3 and how it is different from web2
- Key concepts: blocks, transactions, decentralised networks
- Blockchain vs. traditional databases

## **2. Blockchain Architectures (2 weeks)**

- Public, private, and consortium blockchains
- Permissioned vs. permissionless networks
- Distributed ledger technology (DLT)
- Comparison of major blockchain platforms (Bitcoin, Ethereum, etc.)

## **3. Cryptography for Blockchain (2 Weeks)**

- Cryptographic hash functions
- Public-key cryptography
- Digital signatures
- Merkle trees and their role in blockchain

## **4. Consensus Mechanisms (1 Week)**

- Proof of Work (PoW)
- Proof of Stake (PoS)
- Delegated Proof of Stake (DPoS)
- Practical Byzantine Fault Tolerance (PBFT)
- Other consensus algorithms and their trade-offs

## **5. Security and Privacy in Blockchain (1 Week)**

- Blockchain vulnerabilities and attacks
- Privacy-enhancing techniques (e.g., zero-knowledge proofs)
- Identity management on the blockchain
- Auditing and compliance in blockchain systems

## **6. Smart Contracts – Practical (2 Month)**

- Introduction to smart contracts
- Programming languages for smart contracts (Solidity, etc.)
- Ethereum Virtual Machine (EVM)
- Use cases and potential applications
- Trust Minimised Agreements (Unbreakable promises via smart contracts)

**7. Decentralised Applications – Practical (DApps) (2 month)**

- Introduction to DApps
- Components of DApps (front-end, back-end, smart contracts)
- Building DApps using blockchain platforms (e.g., Ethereum, Hyperledger)

**8. Blockchain Use Cases (2 weeks)**

- Blockchain in finance and banking (Tokenization)
- Supply chain management with blockchain (Case for Halal Certification)
- Healthcare applications
- Intellectual property and digital rights management
- Voting systems and governance (DAOs)

**9. Blockchain Development Tools and Frameworks (6 weeks)**

- Development environments (Remix, Truffle, Hardhat, Foundry etc.)
- Testing and debugging blockchain applications.
- Web3JS, ETHERJS
- Integration with existing systems and APIs (Decentralised Oracles like ChainLink)
- Security best practices for blockchain development

**10. Social, Economic, and Legal Implications of Blockchain (1 Week)**

- Decentralisation and its impact on traditional systems
- Economic models and token economics
- Regulatory and legal considerations for blockchain technology
- Social impact and challenges of blockchain adoption

**11. Final Assignment (1 Month)**

- Final Assignment provided by course administrator