



TECHNOCATION FREELANCING TRAINING INSTITUTE & SOFTWARE HOUSE

Blockchain Development Course Outline

Module 1: Introduction to Blockchain

- Overview of Blockchain Technology
- History and Evolution of Blockchain
- Key Concepts: Decentralization, Immutability, Transparency
- Public vs Private Blockchains
- Consensus Mechanisms (PoW, PoS, DPoS, PBFT, etc.)
- Real-World Use Cases of Blockchain

Module 2: Cryptography & Security Fundamentals

- Basics of Cryptography in Blockchain
- Hash Functions (SHA-256, Keccak-256)
- Asymmetric Cryptography (Public & Private Keys)
- Digital Signatures and Wallets
- Smart Contract Security Best Practices

Module 3: Blockchain Architecture & Components

- Nodes, Miners, and Validators
- Blocks, Transactions, and Ledgers
- Merkle Trees & Data Structures in Blockchain
- Gas Fees & Incentive Mechanisms
- Forks (Soft Forks vs Hard Forks)

Module 4: Hands-on with Ethereum & Smart Contracts

- Introduction to Ethereum Blockchain
- Setting up Ethereum Development Environment
- Solidity Programming Basics
- Writing and Deploying Smart Contracts

- Debugging & Testing Smart Contracts
- Gas Optimization Techniques

Module 5: Smart Contract Development & Security

- Advanced Solidity Concepts
- Reentrancy Attacks & Prevention
- Integer Overflow & Underflow
- Access Control & Authorization Mechanisms
- Secure Coding Best Practices
- Auditing & Security Tools

Module 6: Developing DApps (Decentralized Applications)

- What is a DApp?
- Frontend & Backend Integration
- Web3.js & Ethers.js for Blockchain Interaction
- Using IPFS for Decentralized Storage
- Deploying DApps on Testnets & Mainnets

Module 7: Exploring Other Blockchain Platforms

- Binance Smart Chain (BSC)
- Polkadot & Substrate
- Hyperledger Fabric (Private Blockchains)
- Solana & Rust Programming
- Comparing Different Blockchain Ecosystems

Module 8: DeFi, NFTs, and Web3 Innovations

- Introduction to DeFi (Decentralized Finance)
- Smart Contract-based Lending & Yield Farming
- Understanding Non-Fungible Tokens (NFTs)
- NFT Standards (ERC-721, ERC-1155)
- Developing and Minting NFTs
- Web3 & Metaverse Development

Module 9: Blockchain Interoperability & Scaling

- Layer 1 vs Layer 2 Solutions
- Sidechains & Rollups (Optimistic & ZK-Rollups)
- Cross-chain Bridges & Protocols
- Blockchain Oracles (Chainlink, Band Protocol)
- Real-world Scaling Strategies

Module 10: Advanced Blockchain Development & Enterprise Solutions

- Developing Private & Permissioned Blockchains
- Smart Contract Upgradability & Proxies
- Governance & DAOs (Decentralized Autonomous Organizations)
- Blockchain-as-a-Service (BaaS) Solutions
- Case Studies of Enterprise Blockchain Adoption

Module 11: Final Project & Certification

- Capstone Project: Building a Complete DApp
- Security Audit & Optimization
- Deployment on Mainnet
- Certification & Career Guidance