IICIS

ITKART Institute of Cyber & Information Security

1-Year Advanced Diploma

Blockchain & Web3 Technology

www.iicis.org

48 Weeks (1 Year)

Industry-ready Blockchain Developer, Web3 Engineer, Smart Contract Auditor, DeFi/NFT Specialist

Instructor-led | Hands-on Labs | Case Studies | Capstone Project

Module	Module Title
1	Introduction to Blockchain & Web3
2	Cryptography & Security
3	Ethereum & Smart Contracts – Basics
4	Smart Contracts – Advanced
5	Decentralized Applications (dApps)
6	DeFi Fundamentals
	Revision & Internal Assessment
7	NFTs & Metaverse
8	Enterprise Blockchain & Hyperledger
9	Polkadot, Solana & Other Blockchains
10	DAO & Web3 Governance
11	Scalability, Security & Privacy
12	Capstone Project & Career Preparation
	Final Evaluation

Semester 1 (Month 1–6)
Blockchain & Web3 Foundations

Module 1: Introduction to Blockchain & Web3 (Month 1)

Content:

- Evolution of Internet: Web1 → Web2 → Web3
- Blockchain Fundamentals: Distributed Ledger, Consensus, Mining
- Types of Blockchain: Public, Private, Hybrid, Consortium
- Overview of Web3 Ecosystem: dApps, DAOs, DeFi, NFTs, Metaverse
- Blockchain Use Cases: Finance, Supply Chain, Healthcare, Identity, Gaming

Labs:

1. Install Metamask & create wallet
2. Set up Ethereum test blockchain with Ganache
3. Send & verify transactions on Goerli Testnet

Module 2: Cryptography & Security (Month 2)

Content:

- Hashing Algorithms: SHA-256, Keccak-256
- Public/Private Keys & Digital Signatures
- Symmetric vs Asymmetric Encryption
- Wallets: Hot vs Cold Storage
- Elliptic Curve Cryptography (ECC)
- Blockchain Security: Attack Vectors (Sybil, 51%, Double Spending)

Labs:

1. Generate cryptographic key pairs in Python
2. Implement SHA-256 hashing for text & files
3. Create & verify a digital signature

Module 3: Ethereum & Smart Contracts – Basics (Month 3)

Content:

- Ethereum Architecture & EVM (Ethereum Virtual Machine)
- Gas Fees, Transactions, Blocks
- Solidity Programming Basics
- Smart Contract Deployment: Remix, Hardhat, Truffle
- Testnets: Goerli, Sepolia, Polygon Mumbai

Labs:

1. Write & deploy first "Hello Blockchain" contract
2. Deploy a contract on Polygon Mumbai Testnet
3. Interact with contract using Web3.py

Module 4: Smart Contracts – Advanced (Month 4)

Content:

- Solidity Advanced Concepts: Modifiers, Events, Libraries, Inheritance
- Error Handling, Reentrancy, Overflow, Front-running
- Smart Contract Testing: Mocha, Chai, Hardhat Tests
- Upgradeable Smart Contracts (Proxy Pattern)
- Token Standards: ERC-20, ERC-721, ERC-1155, ERC-4626

Labs:

1. Create & deploy ERC-20 Token with Hardhat
2. Write & mint an ERC-721 NFT with metadata
3. Conduct a reentrancy attack on a vulnerable contract & fix it

Module 5: Decentralized Applications (dApps) (Month 5)

Content:

- Web3.js & Ethers.js for Blockchain Interactions
- React & Next.js for dApp Frontend
- IPFS, Filecoin & Decentralized Storage
- Wallet Integration: Metamask, WalletConnect
- Smart Contract Interaction via Frontend

Labs:

1. Store & retrieve images/files on IPFS
2. Build a React dApp to interact with ERC-20 Token
3. Connect Metamask & execute transactions from frontend

Module 6: DeFi Fundamentals (Month 6)

Content:

- Introduction to Decentralized Finance (DeFi)
- DEXs: Uniswap, PancakeSwap, Curve Finance
- AMM (Automated Market Makers) & Liquidity Pools
- Yield Farming & Staking
- Lending & Borrowing Protocols (Aave, Compound, MakerDAO)
- DeFi Risks: Rug Pulls, Flash Loan Attacks, Impermanent Loss

Labs:

1. Deploy a basic Automated Market Maker (AMM)
2. Provide liquidity on a Uniswap testnet fork
3. Simulate a flash loan using Aave testnet

Semester 2 (Month 7–12)
Advanced Blockchain & Web3 Applications

Module 7: NFTs & Metaverse (Month 7)

Content:

- Non-Fungible Tokens (NFTs): ERC-721, ERC-1155
- Minting, Royalties & NFT Metadata Standards
- NFT Marketplaces: OpenSea, Rarible, LooksRare
- Metaverse Basics: Virtual Worlds, Assets & Avatars
- Web3 Gaming & Play-to-Earn Models

Labs:

1. Mint NFTs & upload metadata to IPFS
2. Create a simple NFT marketplace smart contract
3. Integrate NFTs into a game character asset

Module 8: Enterprise Blockchain & Hyperledger (Month 8)

Content:

- Blockchain for Business & Enterprises
- Hyperledger Fabric & Sawtooth Architecture
- Permissioned vs Permissionless Networks
- Chaincode Development in Go/Node.js
- Blockchain Use Cases: Supply Chain, Finance, Healthcare

Labs:

1. Install & configure Hyperledger Fabric
2. Write chaincode for supply chain tracking
3. Execute private transactions in a permissioned blockchain

Module 9: Polkadot, Solana & Other Blockchains (Month 9)

Content:

- Blockchain Interoperability: Layer 1 vs Layer 2
- Polkadot & Substrate Framework
- Solana Development: Rust & Anchor
- Avalanche, Cosmos, Tezos Ecosystems
- Interoperability Bridges

Labs:

1. Deploy a custom blockchain using Substrate
2. Write & deploy a Solana smart contract with Rust
3. Transfer tokens cross-chain using a bridge

Module 10: DAO & Web3 Governance (Month 10)

Content:

- Decentralized Autonomous Organizations (DAOs)
- DAO Governance Models & Voting Systems
- Token-Based Governance & Treasury Management
- DAO Tools: Aragon, DAOstack, Snapshot

Labs:

1. Create a DAO token & governance rules
2. Propose & vote on a DAO governance decision
3. Integrate Snapshot voting for proposals

Module 11: Scalability, Security & Privacy (Month 11)

Content:

- Blockchain Scalability Issues & Layer-2 Solutions
- Rollups (Optimistic, ZK-Rollups), Plasma, State Channels
- Smart Contract Security & Auditing (MythX, Slither, Oyente)
- Zero-Knowledge Proofs (ZK-SNARKs, ZK-STARKs)
- Privacy Coins: Monero, ZCash
- Blockchain Oracles (Chainlink, Band Protocol)

Labs/Projects:

1. Run a Slither audit on a smart contract
2. Deploy a zk-SNARK proof contract on Ethereum
3. Connect smart contract with Chainlink oracle

Module 12: Capstone Project & Career Preparation (Month 12)

Content:

(Choose 1)

- Build a DeFi Lending Platform
- NFT Marketplace with Royalties
- DAO Governance Platform
- Decentralized Social Media App
- Blockchain-based Voting System

Labs/Projects:

1. Full-stack dApp deployment on IPFS/Arweave
2. CI/CD pipeline for Smart Contracts (DevOps + Blockchain)
3. Resume Building & Interview Prep
4. GitHub Portfolio Setup for Web3 Projects