

CSE436:BLOCKCHAIN

L:3 T:0 P:2 Credits:4

Course Outcomes: Through this course students should be able to

CO1 :: Understand the fundamental concepts of blockchain technology and the role of decentralization in blockchain

CO2 :: Describe the principles of symmetric and public key cryptography used in blockchain systems

CO3 :: Analyze consensus algorithms and the working principles of Bitcoin transactions

CO4 :: Illustrate the Bitcoin network wallets, payment mechanisms, Bitcoin clients, and APIs

CO5 :: Demonstrate smart contract templates, alternative coins, and build smart contracts

CO6 :: Examine Ethereum smart contracts, Geth, and Web3 tools.

Unit I

Introduction to Blockchain : the growth of blockchain technology, the history of blockchain and Bitcoin, distributed systems, blockchain, consensus

Decentralization : decentralization using blockchain, methods of decentralization, routes to decentralization, blockchain and full ecosystem decentralization, pertinent terminology, platforms for decentralization, innovative trends

Unit II

Symmetric Cryptography : working with the openssl command line, cryptographic primitives, Advanced Encryption Standard (AES)

Public Key Cryptography : asymmetric cryptography, cryptographic constructs and blockchain technology

Unit III

Consensus Algorithms : introducing the consensus problem, analysis and design, classification, algorithms, choosing an algorithm

Introduction to Bitcoin : bitcoin — an overview, cryptographic keys, transactions, blockchain, mining

Unit IV

The Bitcoin Network and Payments : the bitcoin network, wallets, bitcoin payments, innovation in bitcoin, advanced protocols, bitcoin investment and buying and selling Bitcoin

Bitcoin Clients and APIs : bitcoin client installation, experimenting further with bitcoin-cli, bitcoin programming

Unit V

Alternative Coins : introducing altcoins, theoretical foundations, difficulty adjustment and retargeting algorithms, bitcoin limitations, extended protocols on top of bitcoin, development of altcoins, Initial Coin Offerings (ICOs)

Smart Contracts : history, definition, ricardian contracts, smart contract templates, oracles, deploying smart contracts, the DAO

Unit VI

Ethereum 101 : ethereum – an overview, the ethereum network, components of the ethereum ecosystem, Ethereum Virtual Machine (EVM), smart contracts, ethereum development environment

Further Ethereum : blocks and blockchain, wallets and client software, nodes and miners, APIs, tools, and DApps, supporting protocols, programming languages

Introducing Web3 : contract deployment, exploring Web3 with Geth, Exploring Web3 with Geth.

List of Practicals / Experiments:

Integrated Development Environments (IDEs) for Smart contract

- MetaMask and Remix IDE to deploy a smart contract.

MetaMask in private net

- Adding a custom network to MetaMask and connecting Remix IDE with MetaMask.

Smart contract with Solidity

- Write an Ethereum smart contract using solidity.

Contract Deployment

- Deploying a contract with MetaMask.

MetaMask and Remix IDE in contract

- Interacting with a contract through MetaMask using Remix IDE.

Use of Geth

- Installation of Ethereum clients and Ethereum account management using Geth.

Genesis Block

- Creation of Genesis Block in Geth.

Text Books:

1. BLOCKCHAIN TECHNOLOGY: CONCEPTS AND APPLICATIONS by KUMAR SAURABH, ASHUTOSH SAXENA, WILEY

References:

1. MASTERING BLOCKCHAIN A DEEP DIVE INTO DISTRIBUTED LEDGERS, CONSENSUS PROTOCOLS, SMART CONTRACTS, DAPPS, CRYPTOCURRENCIES, ETHEREUM, AND MORE by IMRAN BASHIR, PACKT PUBLISHING