

CSC307:BLOCKCHAIN ARCHITECTURE AND DESIGN-I

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

Course Outcomes: Through this course students should be able to

CO1 :: describe the concept of a blockchain application through examples

CO2 :: understand blockchain basics, application templates, and practical setup steps

CO3 :: discuss popular blockchain application templates

CO4 :: demonstrate the application of distributed applications on the Ethereum blockchain for various use cases

CO5 :: use solidity to develop code covering basic data types, variables, operators, control flow statements, functions, and modifiers

CO6 :: analyze the potential benefits and challenges of implementing blockchain solutions in nonfinancial domains

Unit I

Blockchain concepts : blockchain application example-escrow, blockchain stack, from web2.0 to decentralized web, domain-specific blockchain applications, benefits and challenges

Unit II

Blockchain application templates : introduction to blockchain and application templates, explanation of application templates, benefits and use cases, examples of popular blockchain application templates, setting up development environment, setting up blockchain environment, installing necessary software (e.g., Ganache, Truffle, Metamask), configuring blockchain development networks

Unit III

Introduction to Truffle and smart contracts development : overview of Truffle framework, creating a simple smart contract, compiling and deploying smart contracts, using application templates, overview of popular blockchain application templates, discussion on popular templates (e.g., Ethereum, Hyperledger)

Unit IV

Ethereum blockchain : introduction to Ethereum as a blockchain platform, Ethereum network, Ethereum ecosystem, keys, addresses, transaction, message, ether, Ethereum virtual machine

Distributed applications : implementing distributed applications, event registration, document verification, call option, interest plate swap- industrial IOT

Unit V

Solidity : installing Remix IDE (online Solidity compiler and development environment), introduction to token standards (ERC-20, ERC-721), Solidity programming, Smart contract management, User Interface

Unit VI

Non-financial applications of blockchain : internet of things, network supply chain management, healthcare, government, education, media and entertainment, social impact

List of Practicals / Experiments:

List of practicals

- Explore a blockchain network using a simulator using a real-world example of a blockchain application such as an Escrow system.
- Set up a development environment for blockchain applications by deploying a simple application template. Configure and test blockchain networks using tools like Ganache, Truffle, and Metamask.
- Create a simple smart contract using the Truffle framework. Compile and deploy the smart contract and utilize application templates for efficient smart contract development.
- Explore the Ethereum network and ecosystem to execute hands-on exercises with keys, addresses, transactions, and ether. Implement distributed applications for scenarios like event registration and industrial IoT.

- Set up the Solidity development environment using Remix IDE and write Solidity code covering basics, variables, and control flow. Develop and deploy simple smart contracts with a focus on state variables, storage, and transactions.
- Implement distributed applications for scenarios like event registration, document verification, and industrial IoT. Explore event-driven programming in a blockchain context.
- Deploy smart contracts on a test network. Configure and use Remix IDE for smart contract deployment.
- Explore token standards (ERC-20, ERC-721) and their significance. Develop and deploy smart contracts implementing token standards.
- Investigate and discuss non-financial applications of blockchain in areas like healthcare, government, education, and media/entertainment. Develop scenarios and discuss potential blockchain solutions.
- Explore and discuss social impact scenarios involving blockchain, such as charity donations and community governance. Design and present a blockchain solution for a social impact scenario.

Text Books: 1. BLOCKCHAIN APPLICATIONS - A HANDS-ON APPROACH by ARSHDEEP BAHGA AND VIJAY MADISETTI, White Falcon Publishing

References: 1. MASTERING BLOCKCHAIN by IMRAN BASHIR, PACKT PUBLISHING