DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Value Added Course on "Fundamentals of Block Chain and Cryptocurrency"

March 14, 15, 18, 19, 28, 29 – 2022

Fundamentals of Block Chain and Cryptocurrency   **45 hours**

Objectives

- To build own block chain and decentralized block chain network by using the Java script programming language.
- To learn how blockchain technology works under the hood, decentralized blockchain networks function and its technologies
- To understand why blockchain is secure

Unit 1: Introduction   **6 hours**

Introduction to block chain-Introduction to java script-Introduction to Nodejs and npm-Introduction to Test Driven Development-Environmental setup

Unit 2: Building the block   **5 hours**

Components of blockchain-Setup blockchain application-create the building block of blockchain block-starting test-driven development approach to the project- Building genesis block-add functionalities to mine blocks-developing sha-256 hash function

Unit 3: Building the chain   **4 hours**

Create the fundamental block chain class-Developing functionality to validate the block chain-to allow chain replacement-Implementing chain replacement

Unit 4: Proof of work   **5 hours**

Implement the proof of work system- Adjusting the difficulty level of a block- Investigating proof of work methodology- switch the hexadecimal character based difficulty criteria. Prevent a potential difficulty jump attack by adding extra validation for the block chain.

Unit 5: Building API's   **4 hours**

Set up on express library to create API-create a GET request to read the block chain- Add a POST request to read the block chain

Unit 6: Network   **6 hours**

Introduction to Redis-Implementing a real-time messaging network through Redis-Add the ability to broadcast chains- Start peers through alternate parts and broadcasted chains through the api-Synchronizing the chains in the network-Optimize the implementation

Unit 7: Wallets, Keys and Transactions   **10 hours**

Create the core wallet class for the cryptocurrency- Developing the cryptographic key pair and public key addressing system- Implementing signature generation and verification to make transaction official- Build the main transaction class approach to the project- To develop functionality to re-validate transactions-pair transaction creation with the wallet class-Allow transactions to be update with multiple outputs to efficiently use existing objects – improve the hash function to recognize objects with new properties as changes in incoming data – covered edge cases eith transaction updates to prevent vulnerabilities

Unit 8: Project & Assessment   **5 hours**

Create Transaction pool – Mine Transaction

OUTCOMES

At the end of the course, the students will be able to:

   CO1 : Build a working model of a blockchain from scratch using Javascript

   CO2 : Use hashing algorithms to secure the data within the blockchain

   CO3 : Understand and fluently converse on the core software engineering concepts behind blockchain and cryptocurrencies

   CO4 : Build a proof of work algorithm to secure the network

   CO5 : Build an API / server that will be used to interact with the blockchain through the internet

   CO6 : Create a broadcasting system to keep the data in the blockchain network synchronized