ज्ञानेन प्रकाशते जगत् INDUS UNIVERSITY	INDUS INSTITUTE OF TECHNOLOGY& ENGINEERING Constituent Institute of Indus University

Subject: Block Chaining								
Program: B. Tech CE/CSE/IT				Subject Code: CE0722			Semester: VII	
Teaching Scheme (Hours per week)				Examination Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE)- Theory	Continuous Internal Evaluation (CIE)- Practical	Total
3	0	2	5	40	40	60	60	200

Course Objectives:

1. Understand Block chain technology.
2. Develop block chain based solutions and write smart contracts using Hyperledger Fabric and Ethereum frameworks.
3. Build and deploy block chain application for on premise and cloud based architecture.

CONTENTS

UNIT-I

[12 hours]

Introduction:
Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned model of Block chain.

Basic Crypto Primitives:
Cryptographic Hash Function and its properties, Hash pointer and Merkle tree, Digital Signature, Public key cryptography.

UNIT-II

[12 hours]

Understanding Block chain with Cryptocurrency:

Bitcoin and Block chain: Creation of coins, payments and Double spending, Bitcoin Scripts, Bitcoin B2B Network, Transaction in Bitcoin network, Block mining, Block propagation and block relay.

Working with Consensus in Bitcoin:
Distributed consensus in open environments, Consensus in Bitcoin network, Proof of Work(PoW)-basic introduction, Hash cash PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn, Proof of Elapsed Time, The life of Bitcoin Miner, Mining difficulty, Mining pool.

UNIT-III

[12 hours]

Understanding Block chain for Enterprise:
Permissioned model and Use cases, Design issues for permissioned block chain, Execute Contracts, Overview of Consensus models for permissioned block chain,- Distributed Consensus in closed environment, Paxos, RAFT, Byzantine general problem, Byzantine fault tolerant, Pease BFT algorithm, BFT over asynchronous system.

Enterprise application of Block chain:
Cross border payments, Know Your Customer(KYC), Food security, Mortage over Block chain, Block chain enabled trade, Supply chain Financing, Identity on Block chain.

UNIT-IV

[12 hours]

Block chain application development:
Hyperledger Fabric – Architecture, Identities and policies, Membership and Access Control, Channels, Transactions validation, Writing Smart Contracts using Hyperledgers, Overview of Ripple and Corda.

Course Outcomes:

At the end of this subject, students should be able to:

1. Understand what and why of Blockchain and also its major components.
2. Learn about Bitcoin, Cryptocurrency, Ethereum
3. To provide conceptual understanding of how block chain technology can be used to innovate and improve business process.
4. Learn about Hyperledger fabric model and its architecture.
5. Covers the technological underpinning of block chain operations in both theoretical and practical implementation of solutions using block chain technology.
6. Build and deploy block chain application for on premise and cloud based architecture for better employability.

Text Books:

1. Blockchain: Blueprint for a New Economy by Melanie Swan 1st edition, O'Reilly, 2015, Kindle Edition.

Reference Books:

1. Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World by Don Tapscott and Alex Tapscott
2. The Age of Cryptocurrency: How Bitcoin and Digital Money Are Challenging the Global Economic Order by Paul Vigna and Michael J. Casey
3. Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition by Imran Bashir
4. Blockchain Basics: A Non-Technical Introduction in 25 Steps | by Daniel Drescher
5. Mastering Bitcoin: Programming the Open Blockchain | by Andreas M. Antonopoulos
6. The Complete Guide to Understanding Blockchain | by Miles Price

Web Resources:

1. https://blockgeeks.com/guides/what-is-blockchain-technology/
2. https://www.edureka.co/blog/blockchain-tutorial/
3. https://www.guru99.com/blockchain-tutorial.html
4. https://blockchaintutorial.net/

LIST OF EXPERIMENTS

Experiment No.	Title	Learning Outcomes
1	Install and understand Docker container, Node.js, Hyper ledger fabric and perform necessary software installation.	Installation
2	Create and deploy a block chain network.	Deployment
3	Interact with block chain network. Execute transactions and requests against a block chain network.	Understand the architecture
4	Use block chain to track fitness club rewards.	Hands on

5	Car auction network.	practice
6	Deploy an asset transfer app using blockchain.	
7	Develop an IoT asset tracking app using blockchain.	
8	Digital Certificates	
9	Implement secure Hash Algorithm.	Implementation of SHA
10	Case Study.1	Case Study
11	Case Study 2	Case Study