

D.K.T.E. Society's
TEXTILE & ENGINEERING
INSTITUTE
(An Autonomous Institute)
Rajwada, Ichalkaranji – 416115.



Syllabus
of
Blockchain (Honors)
(With effect from June 2021)

D.K.T.E. Society's
TEXTILE & ENGINEERING INSTITUTE
 (An Autonomous Institute)
 Rajwada, Ichalkaranji – 416115.

Department of Computer Science and Engineering (Artificial Intelligence)

Blockchain (Honors)
 (With effect from Academic Year 2021-22)

Syllabus Structure

Sr. No.	Course Code	Course Name	Sem	Teaching Scheme Hours/Week				Examination Scheme and Marks						Credits
				Theory	Tutorial	Practical	Total	Theory			Practical		Total	
								SE-I	SE-II	SEE	CIE	SEE		
1	AIL701	Blockchain Architecture Design and Use Cases	IV	2	1	-	3	25	25	50	-	-	100	03
2	AIL702	Public Blockchain-Ethereum	V	3	-	-	3	25	25	50	-	-	100	03
3	AIP703	Smart Contracts and Cryptocurrency Lab	V	2	-	2	4	-	-	-	50	50	100	03
4	AIL704	Design and Development of Blockchain Applications	VI	3	-	-	3	25	25	50	-	-	100	03
5	AIP705	Blockchain and Distributed Ledger Technology	VI	2	-	2	4	-	-	-	50	50	100	03
6	AIP706	Data Privacy Lab	VII	2	-	2	4	-	-	-	50	50	100	03
7	AID707	Capstone Project	VII	-	-	2	2	-	-	-	50	50	100	02
Total				14	1	8	23	75	75	150	200	200	700	20

DKTES Textile and Engineering Institute , Ichalkaranji
Second Year B. Tech.(Semester – IV)
AIL701: BlockChain Architecture Design and Usecases

Teaching Scheme: Lectures : 02Hrs/Week Tutorials : 01Hrs/Week Practicals: 00 Hrs/Week	Credits 03	Evaluation Scheme: SE-I: 25 Marks SE-II: 25 Marks SEE: 50 Marks
--	-------------------	--

Prerequisite courses, if any:

Data Structures and Algorithm , Computer Networks

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Understand emerging abstract models for Blockchain Technology.

CO2: Understand security models for Blockchain Technology.

CO3: Analyze the concept of bitcoin and mathematical background behind it.

CO4: Design, build, and deploy smart contracts and distributed applications.

CO5: Apply tools for understanding the background of crypto currencies.

CO6: Understand latest advances and applications of BlockChain Technology.

Course Contents

Unit I	Introduction to Blockchain	06 Hours
–Basics of Blockchain :What is Blockchain?,Who uses Blockchain?,Need of Blockchain, - Distributed Vs Centralized Vs Decentralized - Public Ledgers : Blockchain as Public Ledgers, Blockchain Distributed Ledger - Applications of Blockchain -Evolution of Blockchain: History of Blockchain, Blockchain Version(Evaluation of Blockchain)- Essentials of Blockchain : Blockchain Generation, Types of Blockchain, Benifites and Challenges of Blockchain Usages – Limitations of Blockchain - Blockchain Vs Database		
Unit II	Blockchain Architecture Design	06 Hours
Blockchain Design Principles - Components of blockchain - Layered Architecture of Blockchain Ecosystem - Types of Networks .- Distributed Network , P2P Network - Blockchain Consensus Protocols: Proof of Work, Proof of Stake		
Unit III	How Blockchain Works	06 Hours
Défense Against Attackers, Competing Chains - Understanding SHA256 Hash- Immutable Ledger - How Blockchain Works? , Blockchain Demo - How Mining Works? (The NONCE and Cryptographic Puzzle) - Byzantine Fault Tolerance		
Unit IV	Cryptographic Fundamentals	06 Hours
Cryptographic basics for crypto currency - a short overview of Hashing, cryptographic algorithm – SHA 256,signature schemes, encryption schemes and elliptic curve cryptography- Introduction to Hyperledger Hyperledger framework - Public and Private Led		
Unit V	Bit coin & Ethereum Usecases	12 Hours
- Bitcoin - Wallet - Blocks - Merkle Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin. Bitcoin blockchain, the challenges, and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their uses- Ethereum - Ethereum Virtual Machine (EVM) – Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts. Ethereum and Smart Contracts- The Turing Completeness of Smart Contract Languages and verification challenges- comparing Bitcoin scripting vs. Ethereum Smart Contracts –Smart Contracts:- Ethereum Network , What is a Smart Contract? , Ethereum Virtual Machine, Ether, Gas • DApps • Decentralized Autonomous Organizations (DAO) • Hard and Soft Forks • Initial Coin Offerings • Demo of Smart Contracts		

Text Books:

Text Books:

1. Beginning Blockchain : A Beginner's Guide to Building Blockchain Solutions By Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda, Apress Media
2. Melanie Swan, "BlockChain: Blueprint for a New Economy", O'Reilly, first edition – 2015.
3. Daniel Drescher, "BlockChain Basics", Apress; 1st edition, 2017
4. Anshul Kaushik, "BlockChain and Crypto Currencies", Khanna Publishing House, Delhi.
5. Imran Bashir, "Mastering BlockChain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt Publishing, first edition – 2012

References Books:

1. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and BlockChain", Packt Publishing.
2. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017
3. Mastering Blockchain by Imran Bashir, Third Edition, Packt Publication 3. Waterhole, The Science of the Blockchain
4. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
5. Mastering Ethereum: Building Smart Contracts and DAPPS, by Andreas Antonopoulos, Dr. Gavid Wood, Oreilly Publication

Useful Links:

1. <https://cse.iitkgp.ac.in/~dsamanta/courses/se/index.html>
2. <https://nptel.ac.in/courses/106/105/106105087/>

e-Books:

1. [https://developer.ibm.com/patterns/create-and-deploy-block chain-network-using fabric-sdkjava/](https://developer.ibm.com/patterns/create-and-deploy-block-chain-network-using-fabric-sdkjava/)
2. <https://docs.docker.com/getstarted/https://console.ng.bluemix.net/docs/services/block%2520chain/index.html>

DKTES Textile and Engineering Institute, Ichalkaranji
Third Year Hons. In Blockchain (Semester – VI)
AIL704: Design and Development of Blockchain Applications

Teaching Scheme: Lectures: 03 Hrs /Week Tutorials: 00Hrs/Week Practicals: 00 Hrs/Week	Credits 03	Evaluation Scheme: SE-I: 25 Marks SE-II: 25 Marks SEE: 50 Marks
--	-------------------	--

Course Outcomes:

On completion of the course, student should be able to–

- Explain basics of decentralized applications.
- Describe real time applications of blockchain
- Develop applications using blockchain.

Course Contents

Unit I	Understanding Decentralized Applications	07 Hours
---------------	---	-----------------

DApp, Advantages, Disadvantages, User identity in DApps, User accounts in DApps, Accessing the centralized apps, Internal currency in DApps, permissioned DApps, Popular DApps.

Unit II	Understanding How Ethereum Works	06 Hours
----------------	---	-----------------

Overview of Ethereum, Ethereum accounts, Transactions, Consensus, Timestamp, Nonce, Block time, Forking, Genesis block, Ether denominations, Ethereum virtual machine, Gas, Peer discovery, Whisper and Swarm, Geth, Ethereum Wallet, Mist, Weaknesses, Serenity

Unit III	Writing Smart Contracts	06 Hours
-----------------	--------------------------------	-----------------

Solidity source files, The structure of a smart contract, Data location, Control structures, Creating contracts using the new operator, Exceptions, External function calls, Features of contracts, Libraries, Returning multiple values, Importing other Solidity source files, Globally available variables, Ether units,

Unit IV	Introduction to web3.js	06 Hours
----------------	--------------------------------	-----------------

Importing web3.js, Connecting to nodes, The API structure, BigNumber.js, Unit conversion, Retrieving gas price, balance, and transaction details, Sending ether, Working with contracts, Retrieving and listening to contract events, Building a client for an ownership contract, The project structure, Building the backend, Building the frontend, Testing the client

Unit V	Building a Wallet Service	07 Hours
---------------	----------------------------------	-----------------

Difference between online and offline wallets, hooked-web3-provider and ethereumjs-tx libraries, hierarchical deterministic wallet, Introduction to key derivation functions, Introduction to LightWallet, Building a wallet service

Unit VI	Building a Smart Contract Deployment Platform	07 Hours
----------------	--	-----------------

Calculating a transaction's nonce, Introducing solejs, Building a contract deployment platform: The project structure, Building the backend, Building the frontend, Testing

Text Books:

1. Narayan Prusty, Building Blockchain Projects, Packt Publication

References Books:

1. L. Lontz, D. Cawrey, Mastering Blockchain, O'reilly Publication

DKTES Textile and Engineering Institute, Ichalkaranji
Third Year Hons. In Blockchain (Semester – VI)
AIP705: Blockchain and Distributed Ledger Technology

Teaching Scheme: Lectures: 02 Hrs /Week Tutorials: 00Hrs/Week Practicals: 03 Hrs/Week	Credits 03	Evaluation Scheme: CIE: 50 Marks SEE: 50 Marks
--	-------------------	--

Course Outcomes:

On completion of the course, student should be able to–

- Explain basics concepts of blockchain.
- Describe distributed ledger technology
- Develop applications for blockchain.

Course Contents

Unit I	Introduction	07 Hours
Rationale, Objectives, Methodology, Report Structure		
Unit II	Dlt Systems - Setting The Scene	06 Hours
Dlt Systems In The Literature, What Are Dlt Systems, Clarifying Terminology, Actors		
Unit III	Introducing The Framework	06 Hours
Protocol Layer, Network Layer, Data Layer.		
Unit IV	System Interactions	06 Hours
Layer Interdependencies, Layer Hierarchy, Trade-Offs: There Is No ‘One Size Fits All’, A Note On ‘Decentralisation’, Systems Perspective, Exogenous And Endogenous References		
Unit V	A Deeper Dive Into The Framework	07 Hours
Protocol Layer, Network Layer, Data Layer		
Unit VI	Applying The Framework - Case Studies	07 Hours
Bitcoin, Comparative Analysis, Comparing Key Differences Across Dlt System Case Studies		
Text Books:		
1. M. Rauchs, A. Glidden, B. Gordon, G. Pieters, M. Recanatini, F. Rostand, K. Vagneur, B. Zhang, Distributed Ledger Technology Systems, Cambridge Center		