Home

Savitribai Phule Pune University
Fourth Year of Computer Engineering (2019 Course)
410243: Blockchain Technology

Teaching Scheme: TH: 03 Hours/Week	Credit 03	Examination Scheme: In-Sem (Paper): 30 Marks End-Sem (Paper): 70 Marks

Prerequisite Courses: Computer Networks and Security(310244)

Companion Course: Laboratory Practice III(410246)

Course Objectives:

- Technology behind Blockchain
- Crypto currency, Bitcoin and Smart contracts
- Different consensus algorithms used in Blockchain
- Real-world applications of Blockchain
- To analyze Blockchain Ethereum Platform using Solidity
- To Describe Blockchain Case Studies

Course Outcomes:

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

CO1: Interpret the fundamentals and basic concepts in Blockchain
CO2: Compare the working of different blockchain platforms
CO3: Use Crypto wallet for cryptocurrency based transactions
CO4: Analyze the importance of blockchain in finding the solution to the real-world problems.
CO5: Illustrate the Ethereum public block chain platform
CO6: Identify relative application where block chain technology can be effectively used andimplemented.

Course Contents

Unit I	Mathematical Foundation for Blockchain	06 Hours

Cryptography: Symmetric Key Cryptography and Asymmetric Key Cryptography, Elliptic Curve Cryptography (ECC), Cryptographic Hash Functions: SHA256, Digital Signature Algorithm (DSA), Merkel Trees.

#Exemplar/Case Studies	Compare the Symmetric and Asymmetric Cryptography algorithms
*Mapping of Course Outcomes for Unit I	CO1

Unit II	Feature Engineering	07 Hours

History, Centralized Vs. Decentralized Systems, Layers of Blockchain: Application Layer, Execution Layer, Semantic Layer, Propagation Layer, Consensus Layer, Why is Block chain important? Limitations of Centralized Systems, Blockchain Adoption So Far.

#Exemplar/CaseStudies	Study of a research paper based on Blockchain.
*Mapping of Course Outcomes for Unit II	CO1

Unit III	Blockchain Platforms and Consensus in Blockchain	06 Hours

Types of Blockchain Platforms: Public, Private and Consortium, Bitcoin, Ethereum, Hyperledger,IoTA, Corda, R3.
Consensus in Blockchain: Consensus Approach, Consensus Elements, Consensus Algorithms, Proof of Work, Byzantine General problem, Proof of Stake, Proof of Elapsed Time, Proof of
Activity, Proof of Burn.

#Exemplar/Case Studies	Compare different consensus algorithms used in Blockchain Technology.
*Mapping of Course Outcomes for Unit III	CO2

Unit IV	Cryptocurrency – Bitcoin, and Token	06 Hours

Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics Types of Cryptocurrency, Cryptocurrency Usage, Cryptowallets: Metamask, Coinbase, Binance

#Exemplar/Case Studies	Create your own wallet for crypto currency using any of the Blockchain Platforms.
*Mapping of Course Outcomes for Unit IV	CO3

Unit V	Blockchain Ethereum Platform using Solidity	06 Hours

What is Ethereum, Types of Ethereum Networks, EVM (Ethereum Virtual Machine), Introduction to smart contracts, Purpose and types of Smart Contracts, Implementing and deploying smart contracts using Solidity, Swarm (Decentralized Storage Platform),
Whisper (Decentralized Messaging Platform)

#Exemplar/Case Studies	Study Truffle Development Environment.
*Mapping of Course Outcomes for Unit V	CO4

Unit VI	Blockchain Case Studies	06 Hours

Prominent Blockchain Applications, Retail, Banking and Financial Services, Government Sector, Healthcare, IOT, Energy and Utilities, Blockchain Integration with other Domains

#Exemplar/Case Studies	Study 2 uses cases of Blockchain and write a detailed report on every aspect implemented in the same
*Mapping of Course Outcomes for Unit VI	CO5, CO6

Learning Resources

Text Books:

1. Martin Quest, "Blockchain Dynamics: A Quick Beginner's Guide on Understanding the Foundations of Bit coin and Other Crypto currencies", Create Space Independent PublishingPlatform, 15-May-2018
2. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Second Edition, Packt Publishing, 2018
3. Alex Leverington, "Ethereum Programming", Packt Publishing, 2017

Reference Books:

1. Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda, "Beginning Blockchain ABeginner's Guide to Building Blockchain Solutions",2018
2. Chris Dannen, "Introducing Ethereum and Solidity", Foundations of Crypto currency andBlockchain Programming for Beginners
3. Daniel Drescher, "Blockchain Basics", A Non -Technical Introduction in 25Steps.
4. Ritesh Modi, "Solidity Programming Essentials", Packt Publishing,2018
5. Chandramouli Subramanian, Asha A George, Abhilash K A and Meena Karthikeyan, "Blockchain Technology", Universities Press, ISBN-9789389211634

e-Books :

1. https://users.cs.fiu.edu/~prabakar/cen5079/Common/textbooks/Mastering_Blockchain_2nd_Edition.pdf
2. https://www.lopp.net/pdf/princeton_bitcoin_book.pdf
3. https://www.blockchainexpert.uk/book/blockchain-book.pdf

MOOC Courses Links:

1. NPTEL Course on "Introduction to Blockchain Technology & Applications" https://nptel.ac.in/courses/106/104/106104220/
2. NPTEL Course on **b** https://nptel.ac.in/courses/106/105/106105184/

@The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	2	2	-	-	-	-	-	-	-	-
CO4	3	-	2	-	2	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	2
CO6	2	2	2	2	-	-	-	-	-	-	-	-