

Course Code	23AM4701B	Year	IV	Semester	I
Course Category	PEC	Branch	CSE (AI&ML)	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Cryptography and Network Security
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

CO1	Describe blockchain fundamentals, consensus mechanisms, Ethereum, and Hyperledger Fabric to understand their principles and applications.	L2
CO2	Apply blockchain technologies and consensus mechanisms, including Bitcoin architecture, mining, and PoW/PoS models to implement transaction security, ensure consistency, and address challenges in distributed systems.	L3
CO3	Use Ethereum smart contracts, EVM concepts, and Hyperledger Fabric mechanisms to Implement blockchain-based applications and address security, governance, and real-world implementation challenges.	L3
CO4	Analyze consensus mechanisms, Ethereum smart contracts, and Hyperledger Fabric architecture to assess the security, performance, and applicability of blockchain solutions in real-world scenarios.	L4

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Syllabus		
Unit No	Contents	Map ped CO
I	INTRODUCTION TO BLOCKCHAIN: Introduction, Concept of Block chain, History, Definition of Blockchain, Fundamentals of Blockchain, Characteristics of Block chain, Public, Private and Hybrid Blockchains, Architecture of Blockchain.	CO1
II	TECHNOLOGIES BORROWED IN BLOCKCHAIN: Hash pointers, Digital cash and Bitcoin blockchain, Wallets, Blocks Merkle Tree, Hardness of mining, Transaction verifiability, Anonymity and forks, Double spending, Mathematical analysis of properties of Bitcoin, challenges and solution.	CO1, CO2
III	CONSENSUS MECHANISMS: Proof of Work (PoW) as random oracle, Formal treatment of consistency, Liveness and Fairness, Proof of Stake (PoS) based Chains, Hybrid models (PoW + PoS), Byzantine Models of fault tolerance.	CO1, CO2, CO4
IV	ETHEREUM: Ethereum Virtual Machine (EVM) , Wallets for Ethereum, Solidity , Smart Contracts, The Turing Completeness of Smart Contract Languages and verification challenges, Using smart contracts to enforce legal contracts, Comparing Bitcoin scripting vs. Ethereum Smart Contracts, Some attacks on smart contracts.	CO1, CO3, CO4
V	HYPERLEDGER FABRIC: The plug and play platform and mechanisms in permissioned blockchain, Beyond Cryptocurrency, applications of blockchain in cyber security, integrity of information, E-Governance and other contract enforcement mechanisms, Limitations of blockchain as a technology and myths vs reality of blockchain technology.	CO1, CO3, CO4

Learning Resources
Text Books
1. Blockchain Technology: Cryptocurrency and Applications, S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 1st Edition, 2019, Oxford University Press.
2. Bitcoin and Cryptocurrency Technologies, Arvind Narayanan, Joseph Bonneau, Edward W. Felten, Andrew Miller, and Steven Goldfeder, 1st Edition, 2016, Princeton University Press.
3. Blockchain Technology Concepts and Applications, Kumar Saurabh, Ashutosh Saxena, 1st Edition, 2020, Wiley .
References
1. Cryptography and network security principles and practice, William Stallings, 8th edition, 2017, Pearson publication.
2. Blockchain Technology Chandramouli Subramanian, Asha A George, Abhilash K A and Meena Karthikeyan, 1st Edition, 2020, University Press.
3. Mastering Blockchain - Distributed ledger technology, decentralization, and smart contracts explained, Imran Bashir, 3rd Edition, 2018, pakct publication.
E-Recourses and other Digital Material
1. https://drive.google.com/file/d/1PtYaDmWYaqPVGjKDnMYGWO5eoI5wMPtJ/view
2. https://archive.nptel.ac.in/courses/106/104/106104220/
3. https://www.tutorialspoint.com/blockchain/index.htm
4. https://market.tutorialspoint.com/course/blockchain-made-easy/index.asp
5. https://www.coursera.org/specializations/blockchain