BCSE329L	BLOCKCHAIN AND DISTRIBUTED LEDGER TECHNOLOGY	L	T	P	C
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Pre-requisite	**NIL**	**Syllabus version**			
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Course Objectives

1. To understand Blockchain and Distributed Ledger Technologies.
2. To learn the development in Blockchain functionalities.
3. To identify alternative techniques to proof of work for Blockchain protocols, proof of stake/space.

Course Outcomes

After completion of this course, the student shall be able to:

1. Comprehend the functionality of blockchain.
2. Choose a blockchain implementation based on real time scenario.
3. Examine the techniques for anonymity preservation.
4. Determine the Blockchain challenges.
5. Identify the use cases of distributed ledger technology.
6. Evaluate alternative blockchain and their applicability.

Module:1	**Blockchain and Distributed Ledger Fundamentals**	**4 hours**

Blockchain - Distributed Ledger - Cryptographic basics for cryptocurrency - signature schemes, encryption schemes and elliptic curve cryptography - CAP theorem - Categories of Blockchain: Public blockchain, Private blockchain, Permissioned Ledger, Tokenized blockchain, Tokenless blockchain, and Sidechains.

Module:2	**Blockchain Functionality**	**5 hours**

Distributed identity: Public and private keys, Digital identification and wallets - Decentralized network - Permissioned distributed Ledger - Blockchain data structure - Double spending - Network consensus - Sybil attacks - Block rewards and miners - Forks and consensus chain - Finality in Blockchain Consensus - Limitation of proof-of-work - Alternatives to Proof of Work.

Module:3	**Blockchain Implementation**	**4 hours**

Bitcoin and Merkle Root - Eventual Consistency and Bitcoin - Byzantine Fault Tolerance - Bitcoin and Secure Hashing - Bitcoin block-size - Bitcoin Mining - Blockchain Collaborative Implementations: Hyperledger, Corda - Ethereum's ERC 20 and token explosion.

Module:4	**Decentralization using Blockchain**	**4 hours**

Blockchain and full ecosystem decentralization: Smart contract, Decentralized autonomous organization (DAO), Decentralized applications - Platforms for decentralization.

Module:5	**Zero Knowledge Proofs and Protocols in Blockchain**	**4 hours**

Pseudo-anonymity vs. anonymity - Succinct non interactive argument for Knowledge (SNARK) - pairing on Elliptic curves – Zcash - Zk-SNARKS for anonymity preservation.

Module:6	**Blockchain Challenges**	**3 hours**

Blockchain Governance Challenges: Bitcoin Blocksize Debate, The Ethereum DAO Fork, Ethereum's Move to PoS and Scaling Challenges - Blockchain Technical Challenges: Denial-of-Service Attacks, Security in Smart Contracts, Scaling, Sharding.

Module:7	**Distributed Ledger Technology in Alternative Blockchain**	**4 hours**

Kadena, Ripple, Stellar, Rootstock, Drivechain, Quorum – Decentralized Network manager: Tezos, Maidsafe, BigChainDB - Decentralized Cloud Storage: Storj.

Module:8	**Contemporary Issues**	**2 hours**
	Total Lecture hours:	**30 hours**

Text Book

1. Goldfeder, S., Bonneau, J., Miller, A., Felten, E., Narayanan, A. Bitcoin and

	Cryptocurrency Technologies, 2016, 1st edition, Princeton University Press, New Jersey.			
Reference Books				
1.	Iyer, Kedar, et al. Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions., 2018, 1st edition, McGraw-Hill Education, United Kingdom.			
2.	Wattenhofer, R. Distributed Ledger Technology: The Science of the Blockchain, 2017, 1st edition, CreateSpace Independent Publishing Platform, United States.			
Mode of Evaluation: CAT / written assignment / Quiz / FAT				
Recommended by Board of Studies		04-03-2022		
Approved by Academic Council		No. 65	Date	17-03-2022