Nirma University
Institute of Technology, School of Technology
MTech Computer Science and Engineering / MTech Computer Science and Engineering (Information and Network Security) / MTech Computer Science and Engineering (Data Science)

Semester – II

L	T	P	C
2	0	2	3

Course Code	3CS12D201
Course Name	Blockchain Technology

Course Learning Outcomes (CLOs):

At the end of the course, students will be able to

1. comprehend the structure of a Blockchain networks
2. evaluate security issues relating to Blockchain and cryptocurrency
3. design and analyze the applications based on Blockchain technology

Syllabus:

Teaching Hours

Unit I
Introduction to Blockchain: History, Digital Money to Distributed Ledgers, Design Primitives, Protocols, Security, Consensus, Permissions, Privacy

3

Unit II
Blockchain Architecture, Design and Consensus: Basic crypto primitives: Hash, Signature, Hashchain to Blockchain, Basic consensus mechanisms, Requirements for the consensus protocols, PoW and PoS, Scalability aspects of Blockchain consensus protocols

8

Unit III
Permissioned and Public Blockchains: Design goals, Consensus protocols for Permissioned Blockchains, Hyperledger Fabric, Decomposing the consensus process, Hyperledger fabric components, Smart Contracts, Chain code design, Hybrid models (PoS and PoW)

9

Unit IV
Blockchain cryptography: Different techniques for Blockchain cryptography, privacy and security of Blockchain, multi-sig concept

6

Unit V
Recent trends and research issues in Blockchain: Scalability, secure cryptographic protocols on Blockchain, multiparty communication, FinTech and Blockchain applicabilities

4

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 5 experiments to be incorporated.

Suggested Readings^:
1. Narayanan, Arvind,. et al, Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press.
2. Wattenhofer, Roger, The science of the blockchain, CreateSpace Independent Publishing Platform
3. Bahga, Arshdeep, and Vijay Madisetti,. Blockchain Applications: A Hands-on Approach, VPT
4. Nakamoto, Satoshi, Bitcoin: A peer-to-peer electronic cash system, Research Paper
5. Antonopoulos, Andreas M, Mastering Bitcoin: Programming the open blockchain, O'Reilly Media, Inc
6. Diedrich, Henning, Ethereum: Blockchains, digital assets, smart contracts, decentralized autonomous organizations, Wildfire Publishing (Sydney)

L=Lecture, T=Tutorial, P=Practical, C=Credit

^this is not an exhaustive list