

**Nirma University**

**Institute of Technology, School of Technology**

**MTech Computer Science and Engineering / MTech Computer Science and Engineering (Cyber Security) / MTech Computer Science and Engineering (Data Science)**

**Semester – II**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
2	0	2	3

<b>Course Code</b>	6CS266
<b>Course Name</b>	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<sup>^</sup>:**

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

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<sup>^</sup>this is not an exhaustive list

