COURSE TITLE	**BLOCKCHAIN TECHNOLOGY**
COURSE CODE	**01CE0720**
COURSE CREDITS	**3**

Objective:

1 This course provides a comprehensive introduction to blockchain technology, covering its fundamentals, history, types, features, applications, and real-world use cases. Students will gain hands-on experience in working with blockchain technology.

Course Outcomes: After completion of this course, student will be able to:

1 Analyze the fundamental concepts and architecture of Blockchain Technology.

2 Evaluate various consensus algorithms used in blockchain systems.

3 Design and implement smart contracts and understand the role of cryptocurrencies within the Ethereum platform.

4 Analyze the integration of Blockchain and IoT through relevant case studies.

5 Evaluate and design real-time blockchain applications across diverse industries.

Pre-requisite of course: Information and Network Security

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
2	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction to Blockchain** Blockchain: Definition, History as Blockchain 1.0 to 5.0, Types Public, Private, Federated/ Consortium, Needs-Why, Features of Blockchain, Myths between Blockchain and Cryptocurrency, Types of Nodes utilized in Blockchain Networks, Components, Layers Architecture, Centralized vs Decentralized Network System,Design Primitives and Protocols, Public Key Cryptography, Hashing and concepts	7
2	**Consensus Algorithms** Basic of consensus algorithms, Requirements for the consensus protocol for permission less environment, Types of Consensus Algorithm, PoW-Proof of Work, PoS-Proof of Stake, DPoS-Delegated Proof of Stake, PoA- Proof of Authority/ Identity, PoET-Proof of Elapsed Time, BFT- Byzentine Fault Tolerance, PoAh-Proof of Authentication	6

MR. HARDIK AJAYBHAI DOSHI
Digitally signed by (Name of HOD)

DR. RAJENDRASINH BAHADURSINH JADEJA
Digitally signed by (Name of Dean/ Principal)

Contents : Unit	Topics	Contact Hours
3	**Smart Contract and Cryptocurrency** Currency and Tokens, Cryptocurrency, Smart Contract, Smart Contract Design, Decentralized Autonomous Organizations, Digital Tokens, Cryptocurrencies as Legal Tender, Ethereum, Ethereum Structure, Operations, Consensus Model, Incentive Model. Introduction about Cryptocurrency, Incentive Model. Introduction about Cryptocurrency, Distributed Ledger, Bitcoin Protocol- Mining Strategy and Rewards	7
4	**IoT (Internet of Things) and Blockchain** Introduction of IoT, Layer Architecture of IoT, Characteristics of IoT, Layer-wise Security Issues and Attacks, IoT Smart City's Challenges, Blockchain-based Security Solutions for IoT Applications, Convergence of blockchain, IoT, smart city, and 5G, Blockchain as a Services (BaaS)	5
5	**Applications and Challenges in Blockchain** Blockchain in Education, Healthcare, Smart Manufacturing, Smart Vehicular Networks, Limitations and Challenges of Blockchain, Attacks in Blockchain and How to address	3
Total Hours		**28**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Practical–1** To implement and show the Visual Blockchain Demo with SHA-256 Hash.	2
2	**Practical–2** To create a Simple Ethereum Smart Contract with Solidity	2
3	**Practical–3** To perform a simple vending machine smart contract with Solidity	2
4	**Practical–4** To build a safe remote purchase smart contract with solidity	2
5	**Practical–5** To perform a lottery smart contract with solidity.	2
6	**Practical–6** To implement and show the Proof of Work (PoW) in JavaScript	2
7	**Practical-7** To create Blockchain and implement Replay Attacks on blockchain.	4
8	**Practical-8** To create Cryptocurrency and implement Byzantine Generals Problems in Python.	4
9	**Practical-9** To perform a thorough study of Blockchain Development on Hyperledger Fabric using composer.	4

MR. HARDIK AJAYBHAI DOSHI
Digitally signed by (Name of HOD)

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Digitally signed by (Name of Dean/ Principal)

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
10	**Practical-10** To design and develop and to and decentralized applications (DAPPs).	4
Total Hours		**28**

Textbook :

1 Blockchain Technology: Concepts and Applications, Kumar Saurabh and Ashutosh Saxena, Wiley Publication, 2000

References:

1 Blockchain Technology , Blockchain Technology , Chandramouli Subramanian, Asha George, Abhilash K A and Meena Karthikeyan, Universities Press Publication, 2021

2 Blockchain Blueprint for a New Economy, Blockchain Blueprint for a New Economy, Melanie Swan, n, O'Reilly Publication, 2015

3 Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained, Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained, Imran Bashir, Packt Publishing Ltd, 2018

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
25.00	25.00	20.00	15.00	10.00	5.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

3 Practical examination will be conducted atthe end of semester for evaluation of performance of students in laboratory.

4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

Supplementary Resources:

1 https://onlinecourses.nptel.ac.in/noc22_cs44/preview

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Digitally signed by (Name of HOD)

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Supplementary Resources:

2 https://onlinecourses.nptel.ac.in/noc19_cs63/preview