COURSE TITLE	**BLOCKCHAIN**
COURSE CODE	**01CT0721**
COURSE CREDITS	**4**

Objective:

1 The goal of this course is to learn the fundamentals of blockchain technology. Learners will explore numerous facets of blockchain technology during this course, such as its applications in various fields. Learners will gain knowledge of smart contracts, private and public blockchains, and other topics by implementing.

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

1 Understand the basic concepts and technology used for blockchain.

2 Understand the primitives of the distributed computing and cryptography related to blockchain.

3 Apply the concepts of Bitcoin and their usage.

4 Apply security features in blockchain technologies.

5 Solve block chain-based problems and write smart contract using Ethereum Framework.

Pre-requisite of course: Cryptography, Networking and OOP

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction to Cryptography** What is Cryptography, Symmetric Ciphers, Asymmetric Ciphers, Data Encryption, Standard - Advanced Encryption Standard, Multiple Encryption and Triple DES,, MD5 message digest algorithm , Secure hash algorithm (SHA), Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm.	6
2	**Introduction to Blockchain** What is Blockchain, Blockchain Technology Mechanisms & Networks, Blockchain Origins, Objective of Blockchain, Blockchain Challenges, Transactions And Blocks, P2P Systems, Keys As Identity, private vs. public Blockchain, Key Problem Challenges and Solutions	6

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Contents : Unit	Topics	Contact Hours
3	**BitCoin and Cryptocurrency** What is Bitcoin, The Bitcoin Network, The Bitcoin Mining Process, Mining Developments, Bitcoin Wallets, Decentralization and Hard Forks, Ethereum Virtual Machine (EVM), Merkle Tree, Double-Spend Problem, Blockchain And Digital Currency, Transactional Blocks, Impact Of Blockchain Technology On Cryptocurrency.	6
4	**Introduction to Ethereum** What is Ethereum, Introduction to Ethereum, Consensus Mechanisms, How Smart Contracts Work, Metamask Setup, Ethereum Accounts, Receiving Ether's Transaction, Smart Contracts	6
5	**Introduction to Hyperledger** What is Hyperledger? , Distributed Ledger Technology & its Challenges, Hyperledger & Distributed Ledger Technology, Hyperledger Fabric, Hyperledger Composer	6
6	**Solidity Programming** Solidity - Language of Smart Contracts, Installing Solidity & Ethereum Wallet, Basics of Solidity, Layout of a Solidity Source File & Structure of Smart Contracts, General Value Types (Int, Real, String, Bytes, Arrays, Mapping, Enum, address)	8
7	**Blockchain Applications** Internet of Things, Medical Record Management System, Domain Name Service and Future of Blockchain, Alt Coins	4
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Experiment 1** Create a Simple Blockchain in any suitable programming language.	2
2	**Experiment 2** Use Geth to Implement Private Ethereum Block Chain	2
3	**Experiment 3** Build Hyperledger Fabric Client Application.	2
4	**Experiment 4** Build Hyperledger Fabric with Smart Contract.	2
5	**Experiment 5** Case study of Block Chain being used in illegal activities in real world.	2
6	**Experiment 6** Using Python Libraries to develop Block Chain Application.	2
7	**Experiment 7** Write a program to implement cryptographic Hash Function.	2
8	**Experiment 8** Write a program to implement Public Key Infrastructure.	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
9	**Experiment 9** Write a program to implement Key Exchange technique.	2
10	**Experiment 10** Write a program to implement SHA.	2
11	**Experiment 11** Build and deploy block chain application for on premise and cloud-based architecture.	2
12	**Experiment 12** Integrate ideas from various domains and implement them using block chain technology in different perspectives.	2
13	**Experiment 13** Develop a Block chain application for creation of an account.	2
14	**Experiment 14** Develop a Block chain application regarding transaction.	2
15	**Experiment 15** Develop a Block chain application for any Supply Chain Management.	2
Total Hours		**30**

Textbook :

1 Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Antonopoulos, OReilly, 2014

2 ETHEREUM: A Secure Decentralized Transaction Ledger, DR. Gavin Wood, Yellow paper, 2014

References:

1 A survey of attacks on Ethereum smart contracts, A survey of attacks on Ethereum smart contracts, Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, , Springer, 2017

2 Blockchain Basics, Blockchain Basics, D. Drescher, Apress, 2017

3 Bitcoin: A Peer-to-Peer Electronic Cash System, Bitcoin: A Peer-to-Peer Electronic Cash System, Satoshi Nakamoto, Bitcoin, 2008

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**
10.00	20.00	30.00	15.00	15.00	10.00

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Instructional Method:

1. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
2. Practical examination will be conducted at the end of the semester for evaluation of performance of students in laboratory.
3. Students may use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory, etc.
4. The course delivery method will depend upon the requirement of content and need of the students. The teacher in addition to conventional teaching method (Chalk and Talk) may use any of the tools such as demonstration, role play, Quiz, brainstorming, Flipped class, Project based learning, Collaborative learning, MOOCs etc. for effective teaching.

Supplementary Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs44/preview
2. https://www.coursera.org/specializations/blockchain
3. https://www.udemy.com/course/build-your-blockchain-az/
4. https://eduxlabs.com/courses/blockchain-technologytraining/?tab=tab-curriculum