SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

Year: B. Tech IV (Semester VII)

Subject Name: Fundamentals of Blockchain Technology **Subject Code:** BTIT15701
Type of course: Open Elective Course

Prerequisite (if any): -

Rationale: Blockchain is one of the emerging technologies in today's world. It is a decentralized, distributed ledger that records the provenance of a digital asset. With its inherent design, the data stored via Blockchain would be fully secure in terms of integrity. This course includes the fundamentals behind Blockchain architecture, Block structure, basic cryptographic primitives used to implement Blockchain, the popular crypto-currencies i.e. Bitcoin, Ethereum and the use-cases of Blockchain system.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	0	3	60	25	15	00	00	100

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests) CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Contents	Total Hours
1.	**Introduction To Blockchain:** Centralized Systems, Decentralized Systems, Centralized vs. Decentralized Systems, Distributed systems, Blockchain definition, history of blockchain, Generic elements of a blockchain, Features of a blockchain, Tiers of blockchain technology, Types of blockchain	**06**
2.	**Cryptography and Technical Foundations**: Laying the Blockchain Foundation, Cryptography - Introduction, Mathematics, Confidentiality, Integrity, Authentication, Symmetric Key Cryptography, Asymmetric Key Cryptography, Cryptographic Hash Functions, Hash Algorithms, Merkle trees, Patricia trees, Distributed hash tables (DHTs), Digital signatures, MAC and HMAC, Diffie-Hellman Key Exchange, Symmetric vs. Asymmetric Key	**10**

	Cryptography	
3.	**Bitcoin and Cryptocurrency**: Bitcoin definition, Transactions, Bitcoin Blockchain, Wallets, Alternative Coins, Bitcoin limitations	**06**
4.	**Etherum and Smart Contracts:** Smart Contract Definition, Ethereum blockchain, consensus mechanism, Gas, Transactions, Nonce, gasPrice, gasLimit, Ethereum virtual machine (EVM), Accounts, Ethereum Block, Transaction receipts, Transaction validation and execution, Ether, Message, Mining, Ethereum Network	**10**
5.	**Hyperledger and other alternative Blockchain:** Projects, Fabric, Sawtooth lak, Iroha, Blockchain explorer, Fabric chaintool, Fabric SDK Py Corda, Hyperledger as a protocol, Kadena, Ripple, Stellar,Rootstock, Drivechain	**10**
6.	**Blockchain Applications:** Internet of Things-Medical Record Management System-Blockchain in Government and Blockchain Security-Blockchain Use Cases –Finance	**03**

Suggested Specification table with Marks (Theory): (For B.Tech only)

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	30	05	05	-	-

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

Sr. no	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain	Bashir, Imran	Packt Publishing	2017	

	frameworks				
2	Beginning Blockchain - A Beginner's Guide to Building Blockchain Solutions	Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda	Apress Publishng ISBN: 978-1-4842-3443-3	2018	
3	Bitcoin and cryptocurrency technologies: a comprehensive introduction	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder.	Princeton University Press	2016	
4	SoK: Research perspectives and challenges for Bitcoin and cryptocurrency	Joseph Bonneau et al	IEEE Symposium on security and Privacy,	2015	

Course Outcomes:

Sr. No.	**CO statements**	**Marks % weightage**
CO-1	Explain emerging abstract models for Blockchain Technology.	15%
CO-2	Identify different cryptographic techniques used in the blockchain design.	30%
CO-3	Describe various cryptocurrency and their existence using blockchain technology.	10%
CO-4	Analyze the architecture of different blockchain systems and describe their usages in various use-cases.	45%

List of Open learning website:

1. NPTEL: Introduction to Blockchain Technology and Applications (https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs01/)

2. NPTEL: BLOCKCHAIN ARCHITECTURE DESIGN AND USE CASES (https://nptel.ac.in/courses/106/105/106105184/)