

Computer Science Paper XI
Blockchain technology
[Skill enhancement course]

Semester: V	Credits: 2	Subject Code: BS52211	Lectures: 36
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Course Outcomes:

At the end of this course, the learner will be able to:

- explore how blockchain systems (mainly Bitcoin and Ethereum) work
- familiarize with Ethereum, smart contracts and related technologies, and solidity language
- design, build, and deploy smart contracts and distributed applications,
- integrate ideas from blockchain technology into their own projects.

Unit 1: Introduction to Blockchain	06
<ul style="list-style-type: none">Evolution of BlockchainBlockchain Vs DatabaseEssentials of Blockchain (Blockchain generations, types of blockchain, benefits and challenges of blockchain usage)Types of blockchain NetworksLayered Architecture of Blockchain EcosystemComponents of blockchainCryptography (private and public keys, Hashing & Digital Signature)Cryptocurrency, Digital Currency Bitcoin and EthereumSmart ContractsBlockchain use cases	

Unit 2: Working of Blockchain	06
<ul style="list-style-type: none">Understanding SHA256 HashHyper LedgerDistributed P2P NetworkHow Mining Works? (The NONCE and Cryptographic Puzzle)Consensus Protocols: Proof of Work, Proof of State, Défense Against Attackers, Competing Chains, Byzantine Fault ToleranceDemo of Blockchain	

Unit 3: Emerging concepts and frameworks	06
<ul style="list-style-type: none">Ethereum ecosystemEthereum working<ul style="list-style-type: none">Ethereum Virtual Machine, Ether, GasDApps and DAOs<ul style="list-style-type: none">Introduction to Solidity Solidity- File & Structure of Smart Contracts, General Value Types (Int, Real, String, Bytes, Arrays, Mapping, Enum,	

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Chairperson (HoD)	Ms. Ashwini Kulkarni	

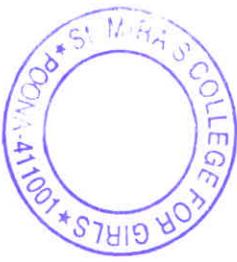


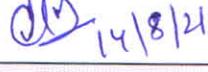
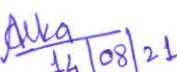
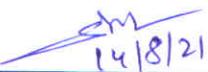
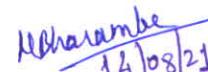
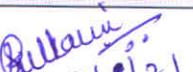
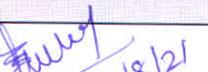
<ul style="list-style-type: none">address), Contract classes, functions, and conditionals○ Inheritance & abstract contracts○ Libraries- Types & optimization of Ether○ Global variables- Debugging○ Future of Ethereum-○ Smart Contracts on Ethereum- different stages of a contract deployment, Viewing Information about blocks in Smart Contracts● Decentralized Autonomous Organizations (DAO)● Hard and Soft Forks● Initial Coin Offerings● Demo of Smart Contracts	
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Unit 4: Programming Assignments(Practical)	18
<ul style="list-style-type: none">● Demonstration of Blockchain● Installation of Ganache, Flask and Postman● Write a Simple Python program to create a Block class that contains index, timestamp, and previous hash. Connect the blocks to create a Blockchain.● Demo of Remix-Ethereum IDE https://remix.ethereum.org and Test Networks.● Create a Simple Blockchain in any suitable programming language.● Write a Simple Smart Contract for Bank with withdraw and deposit. or● Write a Smart Contract for storing and retrieving information of Degree Certificates.	

Recommended Reference Books:
<ul style="list-style-type: none">● A. Narayanan, A. Miller, E. Felten, J. Bonneau, S. Goldfeder, <i>Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction</i>, Princeton University Press, 2016.● Andreas Antonopoulos, Dr. Gavin Wood, <i>Mastering Ethereum: Building Smart Contracts and DAPPS</i>, O'Reilly Publication● Bikramaditya Singhal, Gautam Dhameja, Priyanshu Sekhar Panda, <i>Beginning Blockchain : A Beginner's Guide to Building Blockchain Solutions</i>, Apress Media● DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger," Yellow paper. 2014.● Imran Bashir, <i>Mastering Blockchain</i>, Third Edition, Packt Publication● Satoshi Nakamoto, <i>Bitcoin: A Peer-to-Peer Electronic Cash System</i>

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