Computer Science Paper XI
Blockchain technology
[Skill enhancement course]

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

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

- Evolution of Blockchain
- Blockchain Vs Database
- Essentials of Blockchain (Blockchain generations, types of blockchain, benefits and challenges of blockchain usage)
- Types of blockchain Networks
- Layered Architecture of Blockchain Ecosystem
- Components of blockchain
- Cryptography (private and public keys, Hashing & Digital Signature)
- Cryptocurrency, Digital Currency Bitcoin and Ethereum
- Smart Contracts
- Blockchain use cases

Unit 2: Working of Blockchain	06

- Understanding SHA256 Hash
- Hyper Ledger
- Distributed P2P Network
- How Mining Works? (The NONCE and Cryptographic Puzzle)
- Consensus Protocols: Proof of Work, Proof of State, Défense Against Attackers, Competing Chains, Byzantine Fault Tolerance
- Demo of Blockchain

Unit 3: Emerging concepts and frameworks	06

- Ethereum ecosystem
- Ethereum working
  - Ethereum Virtual Machine, Ether, Gas
- DApps and DAOs
  - Introduction to Solidity Solidity- File & Structure of Smart Contracts, General Value Types (Int, Real, String, Bytes, Arrays, Mapping, Enum,

Board of Studies	Name	Signature
Chairperson (HoD)	Ms. Ashwini Kulkarni	

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	

Unit 4: Programming Assignments(Practical)	**18**
• 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:

- A. Narayanan, A. Miller,E. Felten, J. Bonneau, S. Goldfeder, *Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction,* Princeton University Press, 2016.
- Andreas Antonopoulos, Dr. Gavid Wood, *Mastering Ethereum: Building Smart Contracts and DAPPS,* Oreilly Publication
- Bikramaditya Singhal, Gautam Dhameja, Priyanshu Sekhar Panda, *Beginning Blockchain : A Beginner's Guide to Building Blockchain Solutions* , Apress Media
- DR. Gavin Wood, "*ETHEREUM: A Secure Decentralized Transaction Ledger*,"Yellow paper.2014.
- Imran Bashir, *Mastering Blockchain* , Third Edition, Packt Publication
- Satoshi Nakamoto, Bitcoin: *A Peer-to-Peer Electronic Cash System*

Board of Studies	Name	Signature
Chairperson (HoD)	Ms. Ashwini Kulkarni	

Board of Studies	Name	Signature(in White cell)	
Chairperson (HoD)	Ms. Ashwini Kulkarni	14/8/21	
Faculty	Ms. Ashwini Kulkarni		14/8/21
Faculty	Ms. Alka Kalhapure	14/08/21	
Subject Expert (Outside SPPU)	Prof. Mr.Aniket Nagane		14/8/21
Subject Expert (Outside SPPU)	Dr. Manisha Divate	14/8/21	
VC Nominee	Dr. Manisha Bharambe		14/08/21
Industry Expert	Ms. Snehal Biyala	14/8/21	
Alumni	Ms. Mamta Choudhary		14/8/21

Board of Studies	Name	Signature
Chairperson (HoD)	Ms. Ashwini Kulkarni	