GANPAT UNIVERSITY

FACULTY OF COMPUTER APPLICATIONS

Programme	Master of Computer Applications	**Branch/Spec.**	Computer Application
Semester	II	**Version**	1.0.0.0
Effective from Academic Year	2022-23	**Effective for the batch Admitted in**	June 2022
Subject Code	P12A5BC1	**Subject Name**	Blockchain Technology - I

Teaching scheme						**Examination scheme (Marks)**			
(Per week)	**Lecture (DT)**		**Practical (Lab.)**		**Total**		**CE**	**SEE**	**Total**
	L	TU	P	TW					
Credit	2	0	2	0	4	Theory	40	60	100
Hours	2	0	4	0	6	Practical	20	30	50

Objective:

- To share one's expertise in block chain approaches and to be able to communicate the topics in a systematic and understandable manner.

Pre-requisites:

- Students should have a strong understanding of computer science, information technology, and information security.
- A grasp of the fundamentals of distributed systems, networking, cryptography, and data structures is required.

Course Outcomes :

- **1 = Slight (Low); 2 = Moderate (Medium); 3 = Substantial (High); "-" = No Correlation**

Name of CO	**Description**
CO1	Explain blockchain architecture and components, and illustrate the role of cryptographic techniques in secure decentralized systems.
CO2	Analyze game-theoretic concepts and explain Bitcoin transaction processing, consensus mechanisms, and security practices.
CO3	Develop and execute smart contracts using Solidity and analyze their execution on the Ethereum Virtual Machine.

CO4	Create blockchain decentralized applications and conduct case studies of blockchain.

Mapping of CO and PO								
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	2	1	2	—	—	2	2
CO2	2	3	1	2	—	—	3	1
CO3	3	3	2	3	—	—	2	2
CO4	3	3	3	3	1	1	2	2

Theory Syllabus: Content

Unit	Section -I	Hrs
1	**Fundamentals of Blockchain:** What is Blockchain? History of Blockchain, centralized vs. Decentralized Systems, **Layers of Blockchain:** Application Layer, Execution Layer, Semantic Layer, Propagation Layer, Consensus Layer, why is Blockchain Important? **Blockchain components:** Peer-to-peer networking, Asymmetric cryptography, Cryptographic hashing, Use of Blockchain and Use Cases, Building the Foundation for Blockchain, **Cryptography**: Symmetric Key Cryptography, Cryptographic Hash Functions, MAC and HMAC, Asymmetric Key Cryptography, Diffie-Hellman Key Exchange	8
2	**Game Theory and working with Bitcoin**: Nash Equilibrium, Prisoner's Dilemma, Byzantine Generals' Problem, Zero-Sum Games, Why to Study Game Theory, Merkle Trees, Properties of Blockchain Solutions, Blockchain Transactions, Distributed Consensus Mechanisms, Applications of Blockchain, Scaling Blockchain, **How Bitcoin Works:** What is Bitcoin? Bitcoin Uses, Users and Their Stories, **Working with Bitcoin**: Transactions, Blocks, Mining, and the Blockchain, Constructing a Transaction, Bitcoin Blockchain, Bitcoin Network, Bitcoin Scripts, Full Nodes vs. SPVs, Bitcoin Wallets, Security principles, User Security Best Practices	7
	Section -II	
3	**Working with Ethereum, Smart Contracts and Solidity :** Birth of Ethereum**,** Bitcoin to Ethereum, Ethereum's Four Stages of Development, Ethereum: A General-Purpose Blockchain, Ethereum's Components, Why Learn Ethereum? Ether Currency Units, Getting Started with Meta Mask, Enter the Ethereum Blockchain, Ethereum Smart Contracts, Ethereum Virtual Machine and Code Execution, Ethereum Ecosystem, What Is a Smart Contract? Life Cycle of a Smart Contract, Ethereum High-Level Languages, building a Smart Contract with Solidity, Programming with Solidity, Gas Considerations, Security Risks and Antipatterns,	7
4	**Token, Blockchain Application Development and Building an Ethereum DApp:** How Tokens Are Used, Tokens and Fungibility, Tokens and Intrinsicality, Token Standards ,Decentralized Applications, Blockchain Application Development, Interacting with the Bitcoin Blockchain, Interacting Programmatically with Ethereum—Sending Transactions, Interacting Programmatically with Ethereum—Creating a Smart Contract, Interacting Programmatically with Ethereum—Executing Smart Contract Functions, Public vs. Private Blockchains, Decentralized Application Architecture, What Is a DApp?, Setting Up a Private Ethereum Network, Creating and deploying the Smart Contract	8

Practical Content:

List of programs specified by the subject teacher based on above mentioned topics.

Text Books:

1	Beginning Blockchain, A Beginner's Guide to Building Blockchain Solutions book by Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda 1st Edition Apress 2018.
2	Introducing Ethereum and Solidity Foundations of Cryptocurrency and Blockchain Programming for Beginners by Chris Dannen 1stEdition Apress 2017.
Reference Books:	
1	Mastering Bitcoin book by Andreas M. Antonopoulos 2nd Edition 2017.
2	Mastering Ethereum Building Smart Contracts and DApps by Andreas M. Antonopoulos and Dr. Gavin Wood O'Reilly 2018
MOOC/Certification Courses:	
1	https://nptel.ac.in/courses/106105235
2	https://www.edx.org/
3	https://www.vlab.co.in/
4	https://www.udemy.com/
5	https://www.lynda.com.cach3.com/

Question Paper Scheme:

University Examination Duration: 3 Hours

Note for Examiner: -

(I) Questions 1 and 4 are compulsory with no options.

(II) Internal options should be given in questions 2, 3, 5 and 6.

SECTION – I

Q.1 –8 Marks

Q.2 –11 Marks

Q.3 –11 Marks

SECTION - II

Q.4 –8 Marks

Q.5 –11 Marks

Q.6 –11 Marks