GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelors of Technology		Branch/Spec.	Computer Engineering / Information Technology		
Semester	VII		Version	1.0.0.0		
Effective from Academic Year		2021-22	Effective for the batch Admitted in			Juy-2018
Subject code	2CEIT78PE2	Subject Name	Blockchain Technologies			

Teaching scheme					Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total			
	L	TU	P	TW			CE	SEE	Total
Credit	3	0	1	-	4	Theory	40	60	100
Hours	3	0	2	-	5	Practical	30	20	50

Pre-requisites:

Substantial programming experience

Objectives of the course:

The Course objectives are to:
- Understanding the concept of Blockchain networks and Cryptocurrencies
- Regulatory and policy considerations for designing applications based on Blockchain technology
- Understand how a company can reinvent itself or enter new markets using blockchain technologies
- Comprehend the use Blockchain in real world scenarios and applications

Theory syllabus:

Unit	Content	Hrs
1.	**Introduction to Blockchain:** History, Digital Money to Distributed Ledgers, Design Primitives, Protocols, Security, Consensus, Permissions, Privacy.	04
2.	**Blockchain Architecture, Design and Consensus:** Basic crypto primitives: Hash, Signature, Hashchain to Blockchain, Basic consensus mechanisms, Requirements for the consensus protocols, PoW and PoS, Scalability aspects of Blockchain consensus protocols, Merkle Tree.	10
3.	**Permissioned and Public Blockchains:** Design goals, Consensus protocols for Permissioned Blockchains, Hyperledger Fabric, Decomposing the consensus process, Hyperledger fabric components, Smart Contracts, Chain code design, Hybrid models (PoS and PoW).	10
4.	**Blockchain cryptography:** Different techniques for Blockchain cryptography, privacy and security of Blockchain, multi-sig concept, Cryptographic Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.	06
5.	**Recent trends and research issues in Blockchain:** Use-cases, Scalability, secure cryptographic protocols on Blockchain, multiparty communication, Uses of Blockchain in E-Governance, Security, Land Registration, Medical Information Systems, and others.	06
6.	**The "Evil Sides" of Blockchain and Legal Regulations for Blockchain:** Criminal Use of Payment Blockchains, The Role of Financial Regulations for Blockchain, Does Blockchain Need Legal Regulations? Global Digital Assets Regulatory Trends.	04
7.	**Blockchain Applications:** Decentralized Cryptocurrency, Distributed Cloud Storage, E-Voting, Insurance Claims, Cross-Border Payments, Asset Management, Smart Appliances.	05

Practical content:
- Naive Blockchain construction
- Memory Hard algorithm - Hashcash implementation
- Play with Go-ethereum
- Smart Contract using Solidity
- Build an Application using Blockchain

Text Books:	
1.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press.

Reference Books:	
1.	Wattenhofer, Roger, The science of the blockchain, CreateSpace Independent Publishing Platform.
2.	Bahga, Arshdeep, and Vijay Madisetti,. Blockchain Applications: A Hands-on Approach, VPT.
3.	Antonopoulos, Andreas M, Mastering Bitcoin: Programming the open blockchain, O'Reilly Media, Inc .
4.	Diedrich, Henning, Ethereum: Blockchains, digital assets, smart contracts, decentralized autonomous organizations, Wildfire Publishing (Sydney).
5.	Nakamoto, Satoshi, Bitcoin: A peer-to-peer electronic cash system, Research Paper.

ICT/MOOCs Reference:	
1.	https://www.coursera.org/specializations/blockchain
2.	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs01/
3.	http://cs251crypto.stanford.edu/18au-cs251/

Course Outcomes:

COs	Description
CO1	Understand the structure of a Blockchain networks
CO2	Design and analyze the applications based on Blockchain technology
CO3	Understand how Blockchain systems (mainly Bitcoin and Ethereum) work
CO4	Design, build, and deploy smart contracts and distributed applications
CO5	Evaluate security, privacy, and efficiency of a given blockchain system.

Mapping of CO and PO:												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	3	3	1	1	2	0	-	1	2
CO2	2	3	3	3	3	2	3	2	1	-	1	2
CO3	3	3	1	3	3	1	1	3	1	-	1	2
CO4	2	2	3	3	3	3	3	2	3	-	3	2
CO5	1	1	2	3	3	2	3	3	1	-	2	2