

Course Code	PCS21E06J	Course Name	BLOCK CHAIN TECHNOLOGIES	Course Category	D	Discipline Elective Course	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science	Data Book / Codes/Standards			

Course Learning Rationale (CLR):		The purpose of learning this course is to:		
CLR-1 :	To understand the design principles of Bitcoin and Ethereum.			
CLR-2 :	To learn Nakamoto consensus			
CLR-3 :	Interact with a blockchain system by sending and reading transactions			
CLR-4 :	To design, build, and deploy a distributed application			
CLR-5 :	To evaluate security, privacy, and efficiency of a given blockchain system.			

Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:		
CLO-1 :	Understand how blockchain systems (mainly Bitcoin and Ethereum) work			
CLO-2 :	To securely interact with blockchain nodes			
CLO-3 :	To Broadcast the transactions			
CLO-4 :	Design, build, and deploy smart contracts and distributed applications			
CLO-5 :	Integrate ideas from blockchain technology into their own projects			

Learning			
1	2	3	
Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	PSO 1	PSO 2	PSO 3
L	H	-	H	L	-	-	-						-	-
M	H	L	M	L	-	-	-						-	-
M	H	M	H	L	-	-	-						-	-
M	H	M	H	L	-	-	-						-	-
H	H	M	H	L	-	-	-						-	-

Duration (Hour)	15	15	15	15	15
S-1	SLO-1 Blockchain Introduction	Database Vs. Blockchain Architecture	The Structure of Blockchains	Introduction to Cryptocurrency	Ethereum
	SLO-2 Blockchain Architecture	Types of Blockchain Architecture	Blockchain Data Structure	Blockchain and Cryptocurrency	Overview of Ethereum
S-2	SLO-1 Blockchain Working	Public Blockchains	Transactions	Double Spending	Need for Ethereum
	SLO-2 Blockchain Transactions	Private Blockchains	Blocks	Double Spending Example	Purpose of Ethereum
S-3	SLO-1 Need for Blockchain	Consortium Blockchains	Types of Blocks	Cryptography in Blockchain	Ethereum Vs Bitcoin
	SLO-2 Applications of Blockchain	Hybrid Blockchains	Peer-to-Peer(P2P) Network	Types	Ethereum Blockchain
S4-5	SLO-1 Laboratory 1: Making the Blockchain Network nodes to run	Laboratory 4: Broadcasting the transactions	Laboratory 7: Implementation of an Interface with search functionality	Laboratory 10: Interact with a blockchain system by sending and reading transactions.	Laboratory 13: Smart Contract Construction in Solidity
	SLO-2				
S-6	SLO-1 Blockchain Versions	Main components of Blockchain	Difference between Blockchain and Normal Database	Applications	Features of Ethereum
	SLO-2 Blockchain Variants	Challenges in Blockchain	Consensus	Public Key Cryptography	Applications of Ethereum
S-7	SLO-1 Public	Centralized System	Consensus Algorithm	Use of Cryptography in Blockchain	Smart Contracts on Ethereum
	SLO-2 Private	De-centralized System	Mining	Cryptographic hash functions	Ethereum Vs Ether
S8	SLO-1 Consortium	Key Elements of Blockchain	Proof of Work (PoW)	Types of cryptographic hash functions	Ether- Gas
	SLO-2 Blockchain Use Cases	Distributed ledger technology	Proof of Work Mining	Bitcoin	How Ethereum is different from Bitcoin?
S	SLO-1 Laboratory 2: Implementation of Broadcasting	Laboratory 5: Broadcasting multiple	Laboratory 8: Implementation of PoW	Laboratory 11: Mining puzzles	Laboratory 14: Interact with Solidity

Duration (Hour)		15	15	15	15	15
9-10	SLO-2	Nodes	transactions	algorithm		Contract in nodejs console
S-11	SLO-1	Important Real-life Use Cases of Blockchain	Immutable records	Proof of Stake (PoS)	Types of Bitcoin	Decentralized Applications
	SLO-2	Bitcoin Cryptocurrency	Smart contracts	How Proof of Stake (PoS) works?	Blockchain Hashing	Ethereum and Solidity
S-12	SLO-1	Most Popular Application of Blockchain	Components of Blockchain Architecture	Difference between PoW and PoS	Blockchain Hash Function	Testing in Solidity
	SLO-2	Blockchain Vs. Shared Database	Key Characteristics of Blockchain Architecture	SHA256 Algorithm	Bitcoin Mining	Debugging in Solidity
S-13	SLO-1	Myths about Blockchain	Advantages of Blockchain	Working of SHA256 Algorithm	Purpose of Mining	Advantages of Ethereum
	SLO-2	Limitations of Blockchain Technology	Blockchain Applications	Simplified Byzantine Fault Tolerance (SBFT)	Process of Mining	Disadvantages of Ethereum
S 14-S15	SLO-1	Laboratory 3: Synchronizing the nodes	Laboratory 6: Implementation of Mining	Laboratory 9: Implementation of POS algorithm	Laboratory 12: Design, build, and deploy a distributed application	Laboratory 15: Interact with solidity Contract in web browser

Learning Resources	1. Tiana Laurence, Blockchain for Dummies, (2017), Wiley India Pvt.Ltd. 2. Tim Mathis, Blockchain: The Technology Behind Bitcoin And Other Cryptocurrencies (EBook). 3. Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda, Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions (2018), Apress Media.
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Learning Assessment											
Bloom's Level of Thinking		Continous Learning Assessment(50% Weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4# (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
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