

Branch Name:	COMPUTER ENGINEERING (SOFTWARE ENGINEERING)
Program Code:	ET203
Course Title:	Blockchain Technology
Course Code:	2ET2030305T
Pre-requisite Course:	Expertise in programming, basic knowledge of computer security, cryptography, networking, concurrent or parallel programming would help a student to understand the topics.

Course Objectives: This course aims to provide a conceptual understanding on the function of Blockchains as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable. It covers the technological underpinnings of blockchain operations as distributed data structures and decision making systems, their functionality, and different architecture types. It provides a critical evaluation of existing Smart Contract (SM) capabilities and platforms, and examines their future directions, opportunities, risks and challenges.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Course Contents:

Unit No	Topics	Total Hours	Weightage (%)
1	Discover Blockchain Technology: Blockchain, Growth of blockchain technology, Distributed systems, History of blockchain and Bitcoin, Types of blockchain. Decentralization: Methods of decentralization, Routes of decentralization, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized organizations and platforms for decentralization.	09	15
2	Introduction: Need for Distributed Record Keeping, Modeling faults and adversaries Byzantine Generals problem, Consensus algorithms and their scalability problems Why Nakamoto Came up with Blockchain based cryptocurrency?, Technologies Borrowed in Blockchain – hash pointers, consensus, byzantine fault-tolerant distributed computing, digital cash etc.	07	20
3	Blockchain: Architecture, Versions, Variants, Use cases, Life use cases of blockchain, Blockchain vs shared Database, Introduction to cryptocurrencies, Types, Applications. Bitcoins: Introducing Bitcoin, Bitcoin digital keys and addresses, Transactions, Blockchain mining, Alternative Coins. Limitations of Bitcoin.	08	15
4	Basic Crypto Primitives : Hash functions, Puzzle friendly Hash, Collision resistant hash, digital signatures, public key crypto, verifiable random functions, Zero-knowledge systems.	07	20
5	Introduction to Blockchain Platforms: Ethereum, Hyperledger, IOTA, EOS, Multichain, Bigchain, etc. Advantages and Disadvantages, Ethereum vs Bitcoin, Design a new blockchain, Potential for disruption, Design a distributed application, Blockchain applications.	09	10
6	Privacy, Security issues in Blockchain : Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains – such as Sybil attacks, selfish mining, 51% attacks - advent of algorand, and Sharding based consensus algorithms to prevent these.	09	20

Reference Books:

1. Mark Gates, “Block chain: Ultimate guide to understanding block chain, bit coin, crypto currencies, smart contracts and the future of money”, Wise Fox Publishing and Mark Gates 2017.
2. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, “Hands-On Block chain with Hyper ledger: Building decentralized applications with Hyperledger Fabric and Composer”, 2018.
3. Bahga, Vijay Madiseti, “Block chain Applications: A Hands-On Approach”, Arshdeep Bahga, Vijay Madiseti publishers 2017.
4. Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Crypto currencies”, O'Reilly Media, Inc. 2014.

List of Open-Source Software/learning website:

NPTEL & MOOC courses titled blockchain technology
blockgeeks.com/guide/what-is-block-chain-technology
<https://nptel.ac.in/courses/106105184/>

Course Learning Outcomes (CLO):

Course Outcomes	Description	Bloom's Taxonomy Level
CLO1	Describe the basic concepts and technology used for blockchain.	Understanding (2) Applying (3)
CLO2	Describe the primitives of the distributed computing and cryptography related to blockchain.	Applying (3)
CLO3	Illustrate the concepts of Bitcoin and their usage.	Applying (3)
CLO4	Implement Ethereum block chain contract.	Applying (3)
CLO5	Apply security features in blockchain technologies.	Applying (3)

Mapping of CLO with PO and PSO :

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	M	M	L	M						L	M				
CLO2	H	M	H	L	M						L	L				
CLO3	H	M	M	L	M						H	L				
CLO4	M	M	M	L	M						L	L				
CLO5	M	M	L	L	L						H	L				

H: High, M: Medium, L: Low