

**UNIVERSITY OF MADRAS**  
**MASTER OF COMPUTER APPLICATIONS (MCA) DEGREE PROGRAMME**  
**SYLLABUS WITH EFFECT FROM 2023-2024**

Title of the Paper	<b>Block Chain Technologies</b>		
Elective - III Theory	I Year & II Semester	Credit:3	435E2C

**COURSE OBJECTIVES**

- To understand about Blockchain is an emerging technology platform for developing decentralized applications and data storage.
- To comprehend fundamentals of Public Key Cryptography technology and Consensus Algorithms.
- To familiarize with Bitcoin Network, Bitcoin Clients, APIs and Payments technology of blockchain operations.
- To engage with Components of the Ethereum ecosystem.
- To grasp about Development Tools and Frameworks.

**Unit I: Blockchain, Decentralization**

Blockchain :The growth of blockchain technology - Distributed systems - The history of blockchain and Bitcoin - Blockchain - Consensus - CAP theorem and blockchain. Decentralization: Decentralization using blockchain - Methods of decentralization -Routes to decentralization - Blockchain and full ecosystem decentralization - Pertinent terminology - Platforms for decentralization - Innovative trends.

**Unit II: Public Key Cryptography, Consensus Algorithms and Smart Contracts**

Public Key Cryptography: Asymmetric cryptography - Cryptographic constructs and blockchain technology. Consensus Algorithms: Introducing the consensus problem -Analysis and design - Classification - Algorithms - Choosing an algorithm. Smart Contracts: History - Definition - Ricardian contracts - Smart contract templates – Oracles - Deploying smart contracts - DAO

**Unit III: Bitcoin**

Bitcoin: Bitcoin—an overview - Cryptographic keys - Transactions - Blockchain – Mining. Bitcoin Network and Payments: The Bitcoin network - Wallets - Bitcoin payments -Innovation in Bitcoin - Advanced protocols - Bitcoin investment and buying and sellingBitcoin. Bitcoin Clients and APIs: Bitcoin client installation - Experimenting further with bitcoin-cli - Bitcoin programming.

**Unit IV: Alternative Coins**

Alternative Coins: Theoretical foundations - Difficulty adjustment and retargeting algorithms - Bitcoin limitations - Extended protocols on top of Bitcoin -Development of altcoins.Ethereum: Ethereum – an overview - Ethereum network - Components of the Ethereum ecosystem - EthereumVirtual Machine (EVM) - Smart contracts. - Blocks and blockchain - Wallets and client - Nodes and miners - APIs, tools, and DApps - Supporting protocols - Programming languages.

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### Unit V: Development Tools and Frameworks, Use Cases & Security

Development Tools and Frameworks :Languages - Compilers - Tools and libraries - Frameworks - Contract development and deployment - Layout of a Solidity source code file - Solidity language. Use Cases: IoT – Government - Health -Finance – Media. Scalability and Other Challenges: Scalability - Privacy - Security - Other challenges.

#### TEXT BOOKS

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder. Bitcoin and Crypto currency Technologies. Princeton University Press, 2016. ISBN 978-0691171692

#### REFERENCES

1. Andreas Antonopoulos. Mastering Bitcoin: Programming the open block chain. Oreilly Publishers, 2017. ISBN 978-9352135745

#### Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand, apply and examine the characteristics of blockchain, bitcoin and consensus algorithm in centralized and decentralized methods.	K1-K6
CO2	Comprehend and demonstrate the application of hashing and public key cryptography in protecting the blockchain.	K1-K6
CO3	Understand and analyse the elements of trust in a Blockchain: validation, verification, and consensus.	K1-K6
CO4	Comprehend and evaluate the alternate coin, Ethereum and smart contract.	K1-K6
CO5	Grasp and apply the knowledge of Tools and languages for applications.	K1-K6

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5-Evaluate, K6- Create

#### Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	-	-	-	-	L	-	-	-	-
CO2	S	-	M	-	M	L	-	-	-	-
CO3	S	-	S	-	S	L	-	-	-	S
CO4	S	-	S	-	S	L	-	-	-	S
CO5	S	-	S	-	S	L	-	-	-	S

S- Strong; M-Medium; L-Low