



## Syllabus

<b>Programme Name:</b> B. Tech. (Information Technology)		<b>Session:</b> 2024-28
<b>Course Code:</b> IT 501	<b>Course Name:</b> Introduction to Blockchain Technology	<b>Semester:</b> V

Credits (Total)	L	T	P	Marks (Internal/External)		Contact Hours (per week)	Independent Study Hour (per week)	Section (Group)
3	3	0	0	30	70	3	3	
UG level						Basic and applied	Student- specific course outcome	Higher Education Placement Research

### Course Objective:

The objective of the course “Introduction to Blockchain Technology” is to equip students with a foundational understanding of blockchain technology and its potential applications. Through a combination of theoretical concepts and practical exercises, students will explore the architecture, protocols, and security features that define blockchain systems. The course aims to foster critical thinking about the implications of blockchain for various industries, including finance, healthcare, and supply chain management. By the end of the course, students should be able to articulate the advantages and challenges of blockchain implementations and consider its future developments and opportunities.

**Course outcomes:** After completion of course, the student will be able to:

<b>CO-1</b>	Understand the key concepts underlying blockchain technology, including distributed ledgers, consensus mechanisms, and cryptographic hashing.
<b>CO-2</b>	Identify and analyze various use cases of blockchain technology across different sectors such as finance, healthcare, and logistics, evaluating their benefits and limitations.
<b>CO-3</b>	Acquire knowledge with blockchain development tools and platforms, enabling them to build basic decentralized applications.
<b>CO-4</b>	Understand the security protocols integral to blockchain systems, enabling them to evaluate and mitigate potential vulnerabilities within blockchain networks.
<b>CO-5</b>	Critically assess the societal, ethical, and economic impacts of blockchain technology, fostering an informed perspective on its potential and challenges in real-world scenarios..

**Teaching Pedagogy:**

<b>T1</b>	Classroom teaching (white board), Power Point Presentations, Interactive lectures, Inquiry based teaching
<b>T2</b>	ABL activities, Assignments, Flip Class/ Seminars, Quiz, Oral Viva-voce examination

**Assessment Tools**

<b>AT1-1</b>	Quiz
<b>AT1-2</b>	Activity Based Learning
<b>AT1-3</b>	Midterm Exams
<b>AT1-4</b>	Flip Class
<b>AT1-5</b>	Seminar Presentation
<b>AT1-6</b>	Assignments
<b>AT1-7</b>	Poster
<b>AT1-8</b>	Oral Viva-voce examination
<b>AT1-9</b>	Industrial Visit Report

**Prerequisites:** Basic knowledge of computer networks.

<b>Module wise contents details</b>	<b>Assessment tools</b>
<b>Module I: Introduction (9 Hours)</b> Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. Cryptography: Hash function, Digital Signature – ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.	Quiz Mid-term Exam Assignment
<b>Module II: Blockchain (9 Hours)</b> Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.	Mid-Term Quiz Assignment
<b>Module III: Distributed Consensus (9 Hours)</b> Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.	Mid-Term Oral Viva-voce examination Seminar Presentation
<b>Module IV: Cryptocurrency and Regulation (9 Hours)</b> History, Distributed Ledger, Bitcoin protocols – Mining strategy and rewards, Ethereum -Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin Stakeholders, Roots of Bit	Quiz Assignment Industrial Visit Report Seminar Presentation

coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy. Applications:	
<b>Module V: Blockchain Applications (9 Hours)</b> Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.	Quiz Assignment Industrial Visit Report Poster Oral Viva-voce examination

### Additional Learning:

<b>List of Assignments</b>	<ul style="list-style-type: none"> <li>• Define Blockchain Technology: Explain what blockchain technology is and describe its basic components and functionality.</li> <li>• Distinguish Blockchain Types: Differentiate between public, private, and consortium blockchains. Provide examples of each type and discuss their respective advantages and disadvantages.</li> <li>• Consensus Mechanisms: Describe at least three different consensus mechanisms used in blockchain technologies. What are the pros and cons of each mechanism?</li> <li>• Cryptography in Blockchain: Explain how cryptographic hash functions contribute to the security and integrity of blockchain transactions.</li> <li>• Blockchain and Bitcoin: Discuss how blockchain technology is implemented in Bitcoin. How does Bitcoin utilize blockchain to achieve decentralization and trust?</li> <li>• Smart Contracts: Define smart contracts and explain how they are executed within a blockchain framework. What are potential benefits and risks associated with smart contracts?</li> <li>• Real-World Applications: Identify three real-world applications of blockchain technology outside of cryptocurrency. Describe how blockchain adds value in these applications.</li> <li>• Blockchain Scalability Issues: What are the main scalability challenges facing blockchain technology? Discuss at least two proposed solutions to address these challenges.</li> <li>• Regulatory Considerations: Analyze the impact of regulatory frameworks on blockchain development and adoption. How can regulation both hinder and facilitate blockchain innovation?</li> <li>• Future Trends: Speculate on the future developments in blockchain technology. Which industries might see the next big breakthrough in blockchain applications?</li> </ul>
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<b>Suggested reading:</b>	<ul style="list-style-type: none"> <li>• Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder,</li> <li>• Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press .</li> <li>• Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies</li> <li>• Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts</li> </ul>
<b>Suggested e- resources (Websites/e-books)</b>	<a href="https://onlinecourses.nptel.ac.in/noc22_cs44/preview">https://onlinecourses.nptel.ac.in/noc22_cs44/preview</a>

#### Assessment Plan:

<b>Component of Evaluation</b>	<b>Description</b>	<b>Code</b>	<b>Weightage %</b>
Continuous Internal Evaluation	Mid Term	CT	15%
	Seminar/Viva-Voce/Quiz/Home Assignment	S/V/Q/HA	10%
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking the End Semester examination. The dispensation of 25% includes all types of leaves. including medical leaves.	A	5%
End Semester Examination	End Semester Examination	ESE	70%
<b>Total</b>			<b>100%</b>

**Abbreviations:** CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ESE: End Semester Examination; A: Attendance

### Course Articulation Matrix (Mapping of COs with POs)

Course Outcomes	Correlation with POs												Correlation with PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1	3	1				2		2	1			
CO2	3	2	2	2	2				2		1	1			
CO3	3	2	2	2	2				3		3	1			
CO4	3	3	2	3	2				1		2	1			
CO5	2	2	1	2	3				2		2	1			

1: strongly related, 2: moderately related and 3: weakly related