

**KOLHAPUR INSTITUTE OF
TECHNOLOGY'S COLLEGE OF
ENGINEERING**

**(EMPOWEREDAUTONOMOUS)
GOKUL SHIRGAON, KOLHAPUR**



Department of Computer Science and Business Systems

Curriculum Structure and Syllabus for

B.Tech (Honors)

**Computer Science and Business Systems With specialization in
(Blockchain Technologies)**

(As Per NEP, 2020)

Teaching and Evaluation Scheme								
Course Code	Course	Teaching Scheme				Evaluation Scheme		
		L	T	P	Credits	Component s	Max	Min for Pass (%)
UCBHN0351	Fundamentals of Blockchain	3	1	0	4	ESE	100	40
UCBHN0451	Blockchain Platforms and Use cases	3	1	0	4	ESE	100	40
UCBHN0551	Blockchain Security and Performance	3	1	0	4	ESE	100	40
UCBHN0651	Blockchain and FinTech	3	1	0	4	ESE	100	40
UCBHN0751	MiniProject	0	0	4	2	ESE(POE)	100	40
		-	-	-	-	-	-	-
	Total	12	4	4	18	Total	500	
Total Contact Hours =20, Total Credits =18								

Title of the Course: Fundamentals of Blockchain		L	T	P	Credit									
		3	1	-	4									
Course Code: UCBHN0351														
Course Pre-Requisite: Computer Networks, Network Security														
Course Description: Blockchain, the distributed ledger technology that powers Bitcoin and other digital currencies, has a wide range of other uses as well. It is a decentralized, impenetrable method for storing data and transactions. Blockchain technology, which continues to attract enormous attention and innovation, has the potential to completely transform a number of sectors by offering a safe and transparent mechanism to record and verify data and transactions.														
Course Learning Objectives:														
1. The students should be able to understand a broad overview of the essential concepts of blockchain technology. 2. To familiarize students with Bitcoin protocol followed by the Ethereum protocol – to lay the foundation necessary for developing applications and programming. 3. Students should be able to learn about different types of blockchain and consensus algorithms.														
Course Outcomes:														
CO	After the completion of the course the student should be able to					Bloom’s Cognitive								
						Level	Descriptor							
CO1	Explain the basic notion of distributed systems					II	Understand							
CO2	Use the working of an immutable distributed ledger and trust model that defines blockchain.					II	Understand							
CO3	Illustrate the essential components of a blockchain platform					III	Apply							
CO-PO Mapping:														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2		1	1		1				1	2	
CO2	3	2	2		1	1		2				1	2	
CO3	3	2	2		1	1		1				1	2	

Assessments:**Teacher Assessment:**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	--
MSE	--
ISE-2	--
ESE	100

ESE: is based on 100% course content.

Course Contents:**Unit 1: Basics****08 Hrs.**

The Double-Spend Problem, Byzantine Generals' Computing Problems, Public-Key Cryptography, Hashing, Distributed Systems, Distributed Consensus.

Unit 2: Technology Stack & Bitcoin Blockchain**08 Hrs.**

Blockchain, Protocol, Currency Structure, Operations, Features, Consensus Model, Incentive Model.

Unit 3: Ethereum Blockchain**07 Hrs.**

Smart Contracts, Ethereum Structure, Operations, Consensus Model, Incentive Model

Unit 4 : Tiers of Blockchain Technology**08 Hrs.**

Blockchain 1.0, Blockchain 2.0, Blockchain 3.0, Types of Blockchain: Public Blockchain, Private Blockchain, Semi-Private Blockchain, Sidechains.

Unit 5 : Types of Consensus Algorithms-I**07 Hrs.**

Proof of Stake, Proof of Work, Delegated Proof of Stake, Proof Elapsed Time, Deposit-Based Consensus

Unit 6 : Types of Consensus Algorithms-II**07 Hrs.**

Proof of Importance, Federated Consensus or Federated Byzantine Consensus, Practical Byzantine Fault Tolerance. Blockchain Use Case: Supply Chain Management

Textbooks:

1. Essentials of Bitcoin and Blockchain - 1st edition - Kirankalyan Kulkarni - Packt Publishing
2. Block Chain & Crypto Currencies - 1st edition - Anshul Kaushik - Khanna Publishing House
3. Blockchain for Dummies – 2nd edition - Tiana Laurence- John Wiley & Sons
4. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks- 1st edition - Imran Bashir- Packt Publishing
5. Blockchain: Blueprint for a New Economy- 1st edition - Melanie Swan- Shroff Publisher
O'Reilly Publisher Media
6. Mastering Bitcoin: Programming the Open Blockchain - 1st edition Andreas Antonopoulos
- Shroff/O'Reilly

References:

1. The Basics of Bitcoins and Blockchains-1st edition - Antony Lewis - Two Rivers Distribution
2. The Bitcoin Standard: The Decentralized Alternative to Central Banking - 1st edition -
Saifedean Ammous - Wiley

Title of the Course: Blockchain Platforms and Use cases		L	T	P	Credit									
		3	1	-	4									
Course Code: UCBHN0451														
Course Pre-Requisite: Fundamentals of Block chain Technologies and Security Concepts														
Course Description: This course gives knowledge about various blockchain platforms and use cases.														
Course Learning Objectives:														
1. Students should be able to learn different types of blockchain platforms 2. Students should be able to understand different types of Decentralized applications developed using blockchain technology. 3. Students should be able to understand several types of blockchain use cases.														
Course Outcomes:														
CO	After the completion of the course the student should be able to	Bloom's Cognitive												
		Level	Descriptor											
CO1	To distinguish between different types of blockchain platforms	II	Understand											
CO2	To understand different types of uses of blockchain and apply it to some real-life scenarios accordingly.	II	Understand											
CO3	To learn about the shortcomings of blockchain technology and their corresponding solutions.	III	Analyze											
CO-PO Mapping:														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			1		2			1			1		2	2
CO2		2			2				1			2		
CO3		2		1	2			1					2	

Assessments:**Teacher Assessment:**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	--
MSE	--
ISE-2	--
ESE	100

ESE: is based on 100% course content.

Course Contents:**Unit 1: Permissioned Blockchains-I****08 Hrs.**

Hyperledger Fabric Services, Model and Functions, Hyperledger Composer

Unit 2: Permissioned Blockchains-II**08 Hrs.**

Microsoft Azure Blockchain Platform and Services, Other Platforms: IOTA, TRON, Ziliqa, Cosmos, Ripple

Unit 3: Decentralized Application Platforms**07 Hrs.**

Augur-Decentralized Prediction Market Platform, Grid+-Energy Ecosystem Platform.

Unit 4 : Challenges and Solutions Related to Blockchain**07 Hrs.**

Consensus, Scalability, Privacy and Confidentiality, Escrow, and Multi signature.

Unit 5 : Alternative Decentralized Solutions**07Hrs.**

Interplanetary File System (IPFS) Working and Uses, Hashgraph- Working, Benefits, And Use-Cases.

Unit 6 : Blockchain Use Cases**08 Hrs.**

Financial Services Related Use Cases, Revolutionization of Global Trade, Digital Identity, Auditing Services, Supply Chain Management, HealthcareRelated Services, Blockchain and IOT, Blockchain and AI.

Textbooks:

1. Blockchain for Dummies- 2nd edition - Tiana Laurence- John Wiley & Sons
2. Block Chain & Crypto Currencies -----Anshul Kaushik - Khanna Publishing House
3. Building Blockchain Projects- Narayan Prusty- Packt Publishing

References:

1. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks - **Imran Bashir- Packt Publishing**
 2. Blockchain: Blueprint for a New Economy- 1st edition- Melanie Swan- shroff Publisher publisher/O'Reilly Publisher Media.
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Title of the Course: Blockchain Security and Performance											L	T	P	Credit
Course Code: UCBHN0551											3	1	-	4
Course Pre-Requisite: Fundamentals of Block chain Technologies.														
Course Description: This course gives insights of performance metrics measured in blockchain security														
Course Learning Objectives:														
1. Students should be able to understand the security and performance-related issues of blockchain 2. Students should be able to learn techniques and tools to tackle the security related issues of blockchain 3. Students should be able to learn new approaches required for enhancing blockchain performance.														
Course Outcomes:														
CO	After the completion of the course the student should be able to										Bloom's Cognitive			
											Level	Descriptor		
CO1	To understand the security and performance perspective of blockchain technology.										II	Understand		
CO2	To learn and apply security analysis and performance-enhancing techniques related to blockchain.										III	Analyze		
CO3	To understand the real-life applications of blockchain technology and apply it to provide solutions to some real-life problems.										IV	Apply		
CO-PO Mapping:														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1			1			2
CO2	2			3								2	2	
CO3			2		2						1			2

Assessments:**Teacher Assessment:**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	--
MSE	--
ISE-2	--
ESE	100

ESE: is based on 100% course content.

Course Contents:**Unit 1: Security Issues****08 Hrs.**

Blockchain Related Issues, Higher-Level Language (Solidity) Related Issues, EVM Bytecode Related Issues.

Unit 2: Real Time Applications**07 Hrs.**

Real-Life Attacks on Blockchain Applications/ Smart Contracts, Trusted Execution Environments

Unit 3: Security Tools for Smart Contracts**08 Hrs.**

Working, Advantages, And Disadvantages of Tools- Oyente, Securify, Maian, Manticore, Mythril, SmartCheck, Verx. Secure Key Management, Quantum Resilience Keys.

Unit 4 : Performance Related Issues**07 Hrs.**

Transaction Speed, Transaction Fees, Network Size, Complexity, Interoperability Problems, Lack of Standardization. Lack of Supportive Regulations Related to Blockchain Applications.

Unit 5 : Performance Improvements**08 Hrs.**

Off-Chain State Channels, Sidechains, Parallels Chains, Concurrent Smart Contract Transactions, Sharding Technique and Its Benefits, AtomicSwaps Between Smart Contracts.

Unit 6 : Blockchain Applications**07 Hrs.**

Decentralized Cryptocurrency, Distributed Cloud Storage, EVoting, Insurance Claims, Cross-Border Payments, Asset Management, SmartAppliances.

Textbooks:

1. Mastering Ethereum: Building Smart Contracts and Dapps Book-2nd Edition-Andreas Antonopoulos and Gavin Wood-Shroff Publisher/O'Reilly Publisher.

References:

1. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks - **Imran Bashir- Packt Publishing**
 2. Blockchain: Blueprint for a New Economy- 1st edition- Melanie Swan- shroff Publisher publisher/O'Reilly Publisher Media.
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Title of the Course: Blockchain and FinTech Course Code: UCBHN0651	L	T	P	Credit
	3	1	-	4

Course Pre-Requisite: Fundamentals of Blockchain Technologies

Course Description: This course gives knowledge of Blockchain application and uses in finance applications

Course Learning Objectives:

1. Students should be able to understand the benefits of using blockchain in inancial
2. To learn how decentralized nature of blockchain is impacting banking and financial sector
3. To understand blockchain regulations and future trends related to blockchain to be used in financial sector.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	To understand the benefits of using blockchain in inancial	II	Understand
CO2	To learn how decentralized nature of blockchain is impacting banking and financial sector	III	Analyze
CO3	To understand blockchain regulations and future trends related to blockchain to be used in financial sector	II	Understand

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					2						1	2	1	2
CO2					2						2	2	1	1
CO3					2						1	2	2	

Assessments:**Teacher Assessment:**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	--
MSE	--
ISE-2	--
ESE	100

ESE: is based on 100% course content.

Course Contents:**Unit 1: Cryptocurrencies****08 Hrs.**

Concept, Cryptocurrency Mining, Uses of Cryptocurrencies, Tokens, Token vs Crypto Coin, Concept of ICOs (Initial Coin Offerings), Benefits of Using ICOs, STOs (Security token offerings), ICO vs STO, Cryptocurrency wallets

Unit 2: Decentralized Finance (DeFi)**08 Hrs.**

Concept, Benefits and Risks Associated with DeFi, Centralized vs Decentralized finance, DeFi Projects, DeFi future trends.

Unit 3: Decentralized Markets-I**07 Hrs.**

Concept of Decentralized markets, impact of decentralization on financial market, Decentralized Exchanges (DEX), Security, control and privacy concerns related to DEX

Unit 4 : Decentralized Markets-II**07 Hrs.**

Liquidity and Usability of DEX, best DEXs for trading, Fund Management and Trading logic of DEX, Concept of Decentralized Web.

Unit 5 : Blockchain & Cryptocurrency Regulations**08 Hrs.**

Introduction, History Stance of the Government, Judicial Approach to Cryptocurrency, Possible Reasons for Ban, Virtual Currency Regulations, Global Perspective of Regulations on Blockchain, Future needs for Regulations

Unit 6 : Blockchain in Banking Sector	07 Hrs.
Cross-Border Payments Using Blockchain and Its Benefits, Study of blockchain platforms used for cross-border payments, Impact of Blockchain on Banking Services.	
Textbooks:	
1. Blockchain: Blueprint for a New Economy – 2nd edition - Melanie Swan - shroff Publisher 2. Blockchain in Financial Markets and Beyond: Challenges and Applications- Ron Quaranta- Risk Books Publisher	
References:	
1. Blockchain & FinTech: A Comprehensive Blueprint to Understanding Blockchain & Financial Technology. - Bitcoin, FinTech, Smart Contracts, Cryptocurrency - Richard Hayen- Risk Books Publisher 2. Mastering Ethereum: Building Smart Contracts and Dapps Book- AndreasAntonopoulos and Gavin Wood- Shroff Publisher/O'Reilly Publisher	

Title of the Course: Mini Project											L	T	P	Credit
											-	-	4	2
Course Code: UCBHN0751														
Course Pre-Requisite: Knowledge of basics and advanced in block chain courses														
Course Description: This course gives practical and application-oriented knowledge by implementing real time problems in block chain security domain.														
Course Learning Objectives:														
1. Students should be able to understand the benefits of using blockchain														
2. Students should demonstrate blockchain implementation in various applications.														
3. Students should exhibit knowledge of blockchain through solving application problem.														
Course Outcomes:														
CO	After the completion of the course the student should be able to										Bloom's Cognitive			
											Level	Descriptor		
CO1	To able to understand the benefits of using blockchain										VI	Create		
CO2	To demonstarte blockchain implementation in various applications.										VI	Create		
CO3	To exhibit knowledge of blockchain through solving a pplication problem.										VI	Create		
CO-PO Mapping:														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1					3							2	
CO2		2	3	2										2
CO3				1	3						1		2	2

Assessments:**Teacher Assessment:**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	--
MSE	--
ISE-2	--
ESE	100

ESE: is based on 100% course content.

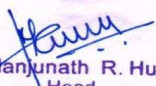
Course Contents:**Mini projects shall consist of followings (but not limited to):****-- Hrs.**

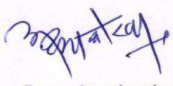
Minor experimental work of various techno-social issues, computer based analysis and design, structural audit of various civil engineering works, health monitoring of structures, Innovative civil engineering materials, Environmental impact assessment, design of small water supply schemes, irrigation schemes, water harvesting, sewerage system, waste management system, transportation engineering etc. related to civil engineering.

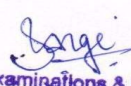
Guidelines:**-- Hrs.**

- 1 Mini-project is a group activity; each group should be of minimum 2 students and maximum 3 students.
- 2 Each batch shall consist of 2 to 3 groups. Not more than one batch should be assigned to a single faculty.
- 3 After interactions with course coordinator and based on comprehensive literature survey/ need analysis, the student shall identify the title and define the aim and objectives of mini-project.
- 4 Student is expected to detail out methodology, software required, critical issues involved in analysis /design and implementation and submit the proposal within one week of the semester.
- 5 Use of relevant software is preferred.
- 6 Completed mini project and documentation in the form of report and is to be submitted before the end of semester assessment.
- 7 Schedule for Presentation:
 - 1 Synopsis Presentation
 - 2 Presentation given by student groups after every 2 weeks – ISE Assessment
 - 3 Final presentation – ESE Assessment




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