

**SIR C.R.REDDY COLLEGE OF ENGINEERING, ELURU**  
**DEPARTMENT OF INFORMATION TECHNOLOGY**  
**COURSE HANDOUT**



**SUBJECT: BLOCKCHAIN TECHNOLOGIES**

**CLASS: IV/IV B.Tech. II SEMESTER, A.Y.2022-23**

**INSTRUCTOR: SRI V GOPINATH**

## Course Handout Index

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### College Vision & Mission

**Vision:** To emerge as a premier institution in the field of technical education and research in the state and as a home for holistic development of the students and contribute to the advancement of society and the region.

**Mission:** To provide high quality technical education through a creative balance of academic and industry oriented learning; to create an inspiring environment of scholarship and research; to instill high levels of academic and professional discipline; and to establish standards that inculcate ethical and moral values that contribute to growth in career and development of society in general.

### **Department Vision & Mission**

**Vision:** To be a premier department in the region in the field of Information Technology through academic excellence and research that enable graduates to meet the challenges of industry and society.

**Mission:** To Provide dynamic teaching-learning environment to make the students industry ready and advancement in career; to inculcate professional and leadership quality for better employability and entrepreneurship; to make high quality professional with moral and ethical values suitable for industry and society.

### **Program Educational Objectives (PEOs)**

**PEO1:** Solve real world problems through effective professional skills in Information Technology industry and academic research.

**PEO2:** Analyze and develop applications in Information Technology domain and adapt to changing technology trends with continuous learning.

**PEO3:** Practice the profession in society with ethical and moral values.

### **Program Outcomes (POs)**

**PO1: Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2: Problem Analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using the first principles of mathematics, natural sciences, and engineering sciences.

**PO3: Design/Development of Solutions:** Design solutions for complex engineering problems and system components or processes that meet the specified needs with appropriate

consideration for the public health and safety, and the cultural, society, and environmental considerations.

**PO4: Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5: Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6: The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7: Environment and Sustainability:** Understand the impact of the professional engineering solutions in society and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9: Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

**PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11: Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

**PO12: Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

#### **Program Specific Outcomes (PSOs)**

**PSO1: Design Skill:** Design and develop softwares in the area of relevance under realistic constraints.

**PSO2: New Technology:** Adapt new and fast emerging technologies in the field of Information Technology.

## JNTUK Academic Calendar

Website: [www.jntuk.edu.in](http://www.jntuk.edu.in)  
Email: [dap@jntuk.edu.in](mailto:dap@jntuk.edu.in)



Phone: 0884-2300991

**Directorate of Academic Planning**  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA  
KAKINADA-533003, Andhra Pradesh, INDIA  
(Established by AP Government Act No. 30 of 2008)

*Lr. No. DAP/AC/IV Year /B. Tech/B. Pharmacy/2022*

*Date 25.06.2022*

**Dr. KVSG Murali Krishna,**  
*M.E, Ph.D.,*

**Director, Academic Planning**  
**JNTUK, Kakinada**

To  
All the Principals of Affiliated Colleges,  
JNTUK, Kakinada.

### Academic Calendar for IV Year - B. Tech/B. Pharmacy for the AY 2022-23

I SEMESTER			
Description	From	To	Weeks
<b>Commencement of Class Work</b>	<b>04.07.2022</b>		
I Unit of Instruction	04.07.2022	27.08.2022	8W
I Mid Examinations	29.08.2022	03.09.2022	1W
II Unit of Instructions	05.09.2022	29.10.2022	8W
II Mid Examinations	31.10.2022	05.11.2022	1W
Preparation & Practicals	07.11.2022	12.11.2022	1W
End Examinations	14.11.2022	26.11.2022	2W
Commencement of II Semester Class Work	<b>05.12.2022</b>		
II SEMESTER			
I Unit of Instructions	<b>05.12.2022</b>	28.01.2023	8W
I Mid Examinations	30.01.2023	04.02.2023	1W
II Unit of Instructions	06.02.2023	01.04.2023	8W
II Mid Examinations	03.04.2023	08.04.2023	1W
Preparation & Practicals	10.04.2023	15.04.2023	1W
End Examinations	17.04.2023	29.04.2023	2W

  
**Director,** 25/6/22  
**Academics & Planning,**  
**Director**  
**Academic Planning**  
**JNTUK Kakinada**

Copy to the Secretary to the Hon'ble Vice Chancellor, JNTUK  
Copy to Rector, Registrar, JNTUK  
Copy to Director Academic Audit, JNTUK  
Copy to Director of Evaluation, JNTUK

## Department Academic Calendar



### Department of Information Technology IV/IV B.Tech Academic Calendar for 2022-23

2022-23	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M			
Jul 22						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31				
Aug 22	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31									
Sep 22				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30							
Oct 22						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31				
Nov 22		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30									
Dec 22					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31					
Jan 23	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31									
Feb 23			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28										
Mar 23			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31							
Apr 23					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30						
May 23	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31									
Jun 23				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30							

<b>List of Holidays</b>	Oct 9: Maulud Nabi	Mar 22 : Ugadhi	Mid exams
July 10: Bakrid	Oct 24 : Diwali	Mar 30: Surrana navami	End Examinations
Aug 9: Moharum	Dec 25 : Christmas	Apr 5: Babu Jagivan Ram Jayanthi	Commencement of Class work
Aug 15: Independence day	Jan 14-16: sankranti	Apr 7: Good friday	Workshops
Aug 31: Ganesh Chaturdi	Jan 26: Republic Day	Apr 14: Ambedkar Jayanthi	Department fest/Elite
Oct 2: Gandhi jayanthi	Feb 18 : Sivaratri	Jun 29: Bakrid	
Oct 5: Vijayadasami	Mar 8 : holi		
			HoD
			Department of IT

### Course Description

Blockchain technology was created just 10 years ago. And yet within this short period of time, it has created ripples across the industries. Many people think that blockchain and bitcoins are synonymous. But they are not. Even if bitcoin has a bad reputation, the regulators and industry leaders cannot overlook the usefulness of blockchain. The adoption of blockchain in the organizations and across various sectors is not a matter of 'if' - it is a matter of 'when.' Blockchain is still in its early phase. Hence, the competition is less as of now. The price of blockchain courses is also within reach. If a student opts for blockchain courses today, his future will be quite bright. The implementation of blockchain is at its nascent stage. There will be a shortage of skilled blockchain developers during the initial years of blockchain development. So, the blockchain development courses today will make a candidate stand on his firm foot tomorrow.

### Course Objectives

This course aims at training students to master the:

1. Impart strong technical understanding of Blockchain technologies
2. Develop familiarity of current technologies, tools, and implementation strategies
3. Introduce application areas, current practices, and research activity.
4. Describe the concepts of Ethereum technology with some usecases.
5. Familiar with the Hyper ledger concepts of blockchain.

## Course Outcomes

Students are able to

CO No's	Cos	Level
CO1	Outline the Basic and advanced concepts in Blockchain.	L2
CO2	Identify the Architecting Blockchain solutions for various applications.	L2
CO3	Review the Ethereum Blockchain implementations.	L2
CO4	Discuss the Hyperledger Blockchain implementation.	L2

<b>IV Year – II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>BLOCKCHAIN TECHNOLOGIES</b>					

## Syllabus

**UNIT I Introduction**, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain.

**Evolution of Blockchain** : Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

**UNIT II Blockchain Concepts:** Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

**UNIT III Architecting Blockchain solutions:** Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications, Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

**UNIT IV Ethereum Blockchain Implementation:** Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, OpenZeppelin Contracts

**UNIT V Hyperledger Blockchain Implementation,** Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.

**Advanced Concepts in Blockchain:** Introduction, InterPlanetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

**Text Books:** 1) Ambadas, Arshad Sarfarz Ariff, Sham “Blockchain for Enterprise Application Developers”, Wiley 2) Andreas M. Antonopoulos, “Mastering Bitcoin: Programming the Open Blockchain” , O’Reilly

**Reference Books:** 1) Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill. 2) Blockchain: Blueprint for a New Economy, Melanie Swan, O’Reilly

**e-Resources:** 1) <https://github.com/blockchainedindia/resources>

**Lesson Plan**

S. No	Unit	Topic	Teaching Aids	CO
1	I	<b>Introduction</b>	BB	CO1
2		Scenarios, Challenges Articulated.	BB	CO1
3		Blockchain, Blockchain Characteristics	BB	CO1
4		Opportunities Using Blockchain, History of Blockchain.	BB	CO1
5		<b>Evolution of Blockchain</b> : Evolution of Computer Applications	BB	CO1
6		Centralized Applications, Decentralized Applications	PPT	CO1
7		Stages in Blockchain Evolution, Consortia, Forks	PPT	CO1
8		Public Blockchain Environments	PPT	CO1
9		Type of Players in Blockchain Ecosystem	BB/PPT	CO1
10		Players in Market	BB	CO1
11	II	<b>Blockchain Concepts:</b> Introduction	BB	CO1
12		Changing of Blocks	BB/PPT	CO1
13		Hashing, Merkle-Tree	BB/PPT	CO1
14		Consensus, Mining and Finalizing Blocks	BB/PPT	CO1



15		Currency aka tokens	BB	CO1
16		security on blockchain	BB	CO1
17		data storage on blockchain, wallets.	BB	CO1
18		coding on blockchain	BB/PPT	CO1
19		smart contracts	BB	CO1
20		peer-to-peer network	BB/PPT	CO1
21		types of blockchain nodes	BB	CO1
22		risk associated with blockchain solutions	BB	CO1
23		life cycle of blockchain transaction	BB/PPT	CO1
24	III	<b>Architecting Blockchain solutions:</b> Introduction	BB/PPT	CO2
25		Obstacles for Use of Blockchain	BB	CO2
26		Blockchain Relevance Evaluation Framework.	BB/PPT	CO2
27		Blockchain Solutions Reference Architecture	BB	CO2
28		Types of Blockchain Applications	BB/PPT	CO2
29		Cryptographic Tokens	BB/PPT	CO2
30		Typical Solution Architecture for Enterprise Use Cases	BB	CO2
31		Types of Blockchain Solutions	BB	CO2
32		Architecture Considerations	BB	CO2
33		Architecture with Blockchain Platforms	BB/PPT	CO2
34		Approach for Designing Blockchain Applications	BB	CO2
35		IV	<b>Ethereum Blockchain Implementation:</b> Introduction	BB
36	Tuna Fish Tracking Use Case		BB/PPT	CO3
37	Ethereum Ecosystem		BB	CO3
38	Ethereum Development		BB/PPT	CO3
39	Ethereum Tool Stack		BB	CO3
40	Ethereum Virtual Machine		BB	CO3
41	Smart Contract Programming		BB	CO3
42	Integrated Development Environment		BB	CO3
43	Truffle Framework		BB/PPT	CO3
44	Ganache, Unit Testing		BB	CO3
45	Ethereum Accounts		BB/PPT	CO3

46		MyEtherWallet	BB	CO3
47		Ethereum Networks/Environments	BB	CO3
48		Infura, Etherscan	BB/PPT	CO3
49		Ethereum Clients, Decentralized Application	BB	CO3
50		Metamask, Tuna Fish Use Case Implementation, OpenZeppelin Contracts	BB	CO3
51	V	<b>Hyperledger Blockchain Implementation, Introduction</b>	BB/PPT	CO4
52		Use Case – Car Ownership Tracking	BB	CO4
53		Hyperledger Fabric, Hyperledger Fabric Transaction Flow	BB/PPT	CO4
54		FabCar Use Case Implementation	BB	CO4
55		Invoking Chaincode Functions Using Client Application.	BB/PPT	CO4
56		<b>Advanced Concepts in Blockchain: Introduction</b>	BB	CO4
57		InterPlanetary File System (IPFS)	BB/PPT	CO4
58		Zero-Knowledge Proofs, Oracles	BB/PPT	CO4
59		Self-Sovereign Identity	BB	CO4
60		Blockchain with IoT and AI/ML Quantum Computing and Blockchain	BB/PPT	CO4
61		Initial Coin Offering, Blockchain Cloud Offerings	BB	CO4
62		Blockchain and its Future Potential.	BB/PPT	CO4

### Evaluation Pattern

S. No	Components	Internal	External	Total
1	Theory	25	75	100
2	Engineering Graphics/Design/Drawing	25	75	100
3	Practical	20	30	50
4	Mini Project/Internship/Industrial Training/ Skill Development programmes/Research Project	-	50	50
5	Project Work – Part I	20	30	50
5	Project Work – Part II	60	90	150

Marks Range Theory (Max – 100)	Marks Range Lab (Max – 75)	Letter Grade	Level	Grade Point
≥ 90	≥ 67	O	Outstanding	10
≥80 to <90	≥60 to <67	S	Excellent	9
≥70 to <80	≥52 to <60	A	Very Good	8

≥60 to <70	≥45 to <52	B	Good	7
≥50 to <60	≥37 to <45	C	Fair	6
≥40 to <50	≥30 to <37	D	Satisfactory	5
<40	<30	F	Fail	0
			Absent	0

## Timetable

**SIR CRREDDY COLLEGE OF ENGINEERING, ELURU**  
**DEPARTMENT OF INFORMATION TECHNOLOGY**  
**IV/IV B.Tech IT – II SEMESTER A.Y 2022-2023**

**TIME TABLE A -SECTION**

With effect from :05-12-2022      Class Teacher: Sri. V. Gopinath      LH - 49

	1	2	3	4		5	6	7	8
DAY	09:00 To 09:50	09:50 To 10:40	11:00 To 11:50	11:50 To 12:40		1:40 To 2:30	02:30 To 03:20	03:20 To 04:10	04:10 To 5:00
MON	BCT	BCT	ES	MOB(T)	L	*****			
TUE	PROJECT-II				U	*****			
WED	ES	ES	MOB	BCT(T)	N	*****			
THU	MOB	MOB	BCT	ES(T)	C	*****			
FRI	PROJECT -II				H	*****			
SAT	*****					*****			

**TIME TABLE B -SECTION**

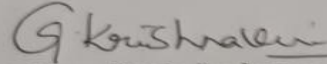
With effect from :05-12-2022      Class Teacher: Sri. N. Prasad      LH - 50

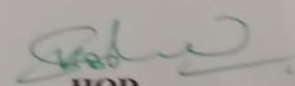
	1	2	3	4		5	6	7	8
DAY	09:00 To 09:50	09:50 To 10:40	11:00 To 11:50	11:50 To 12:40		1:40 To 2:30	02:30 To 03:20	03:20 To 04:10	04:10 To 5:00
MON	MOB	ES	MOB	BCT(T)	L	*****			
TUE	PROJECT-II				U	*****			
WED	BCT	BCT	ES	MOB(T)	N	*****			
THU	ES	ES(T)	MOB	BCT	C	*****			
FRI	PROJECT-II				H	*****			
SAT	*****					*****			

\*T - Tutorial

**STAFF:**

Management and Organizational Behavior	: Sri. G.Vihari
Entrepreneurship	: Sri. N.Prasad (A) /Dr. S.Krishna Rao (B)
Blockchain Technologies	: Sri. V.Gopinath
Project-II(A- Section)	: Dr. S.Krishna Rao / NP / VGN
Project-II(B- Section)	: Dr. S.Krishna Rao /TSNM/GV

  
 Dept. Time Table Incharge

  
 HOD,  
 Dept. of. I.T

**HEAD OF THE DEPARTMENT**  
**Information Technology**  
 Sir C.R.R. College of Engg  
 ELURU-534 007.

**Google Class room link:**

<https://classroom.google.com/c/NTcxNDY1MDI2MTY5?cjc=3pcfiwp>

**class code: 3pcfiwp**