



Department of Information Technology

NBA Accredited

A.P. Shah Institute of Technology

G.B.Road, Kasarvadavli, Thane (W), Mumbai-400615

UNIVERSITY OF MUMBAI

Academic Year 2023-2024

Comprehensive Certificate Validation and Verification System for Educational Institute using Blockchain

INFORMATION TECHNOLOGY

By

Sakshi Balekar (20104103)

Sarthak More (20104116)

Prathamesh Lambate (20104046)

Jaykumar Nayi (20104005)

Under the Guidance of
Prof. Mandar Ganjapurkar



1. Project Conception and Initiation

1.1 Abstract

- The Comprehensive Certificate Validation & Verification System for Educational Institutes utilizing Blockchain technology is a groundbreaking solution that revolutionizes the authentication and validation of educational certificates.
- By harnessing the power of blockchain, this system ensures that certificates remain tamper-proof and trustworthy.
- It employs an immutable Ethereum blockchain to securely store certificate data, guaranteeing its integrity and preventing unauthorized alterations.
- With an intuitive user interface, both certificate issuers and verifiers can seamlessly upload, access, and validate certificates through a user-friendly web application.
- Overall, this system offers transparency, accountability, and scalability, ultimately benefitting students, employers, and educational institutions by enhancing the integrity and accessibility of educational certificates.

1.2 Objectives

- To create a user friendly web interface for verifying certificates using WEB 3.0
- To use Ethereum Blockchain for verification and validation.
- To create a platform like Digi Locker using Cloud Infrastructure.
- To ensure that certificates are tamper-proof and trustworthy.

1.3 Literature Review

SR. NO	TITLE	KEY FINDINGS	YEAR
1.	A systematic Literature Review on Blockchain-Based Systems for Academic Certificate Verification	<ul style="list-style-type: none">• It focuses on the adoption of blockchain for verifying academic credentials, particularly diplomas.• Several challenges to widespread adoption of blockchain for diploma verification were identified, including automation, immutability of smart contracts, maintenance costs, knowledge gaps, off-chain transfer, big data management, energy consumption, adaptability, and identity verification.	2023

1.3 Literature Review

SR. NO	TITLE	KEY FINDINGS	YEAR
2.	Certificate Verification using Blockchain and Generation of Transcript	<ul style="list-style-type: none">• The system automates the process of certificate generation, reducing the need for manual intervention.• The certificate's hash is stored on the blockchain, while the original document is stored in the Inter Planetary File System (IPFS).• This dual storage approach ensures data preservation and fosters transparency in the verification process.	2021

1.3 Literature Review

SR. NO	TITLE	KEY FINDINGS	YEAR
3.	A Blockchain-Based E-Commerce Reputation System Built With Verifiable Credentials	<ul style="list-style-type: none">• The proposed model has been developed into a software system and deployed on cloud servers.• Performance evaluations indicate that the system is feasible and can be integrated into existing e-commerce ecosystems.• The system is built on a permissioned blockchain, specifically Hyperledger Fabric.• Integration of verifiable credentials as digital identities, proofs of transactions, and feedback submissions makes the model innovative and robust.	2023

1.4 Problem Definition

- The existing methods of certificate verification and validation are plagued by issues such as forgery, inefficiency, lack of transparency, and data security concerns.
- These problems undermine the credibility and reliability of certificates, leading to delays, fraud, and a lack of trust in critical processes involving certification.
- As a result, the proposed system leverages the innovative capabilities of blockchain technology to address these pressing issues.
- This system leverages the inherent security and transparency of blockchain to establish a tamper-proof and decentralized framework for validating educational certificates.

1.5 Scope

- The implementation of an user friendly web interface integrated with blockchain for verifying certificates in an educational institute.
- This includes querying a database, fetching data from blockchain and immediate feedback on whether data entered is valid or not.
- It allows educational institutions to securely issue and store academic records for their students.
- The system provides an intuitive interface for both certificate issuers and verifiers.
- Certificate issuers can easily upload and record certificates, while verifiers can efficiently access and validate them through a user-friendly web application.

1.6 Technology stack

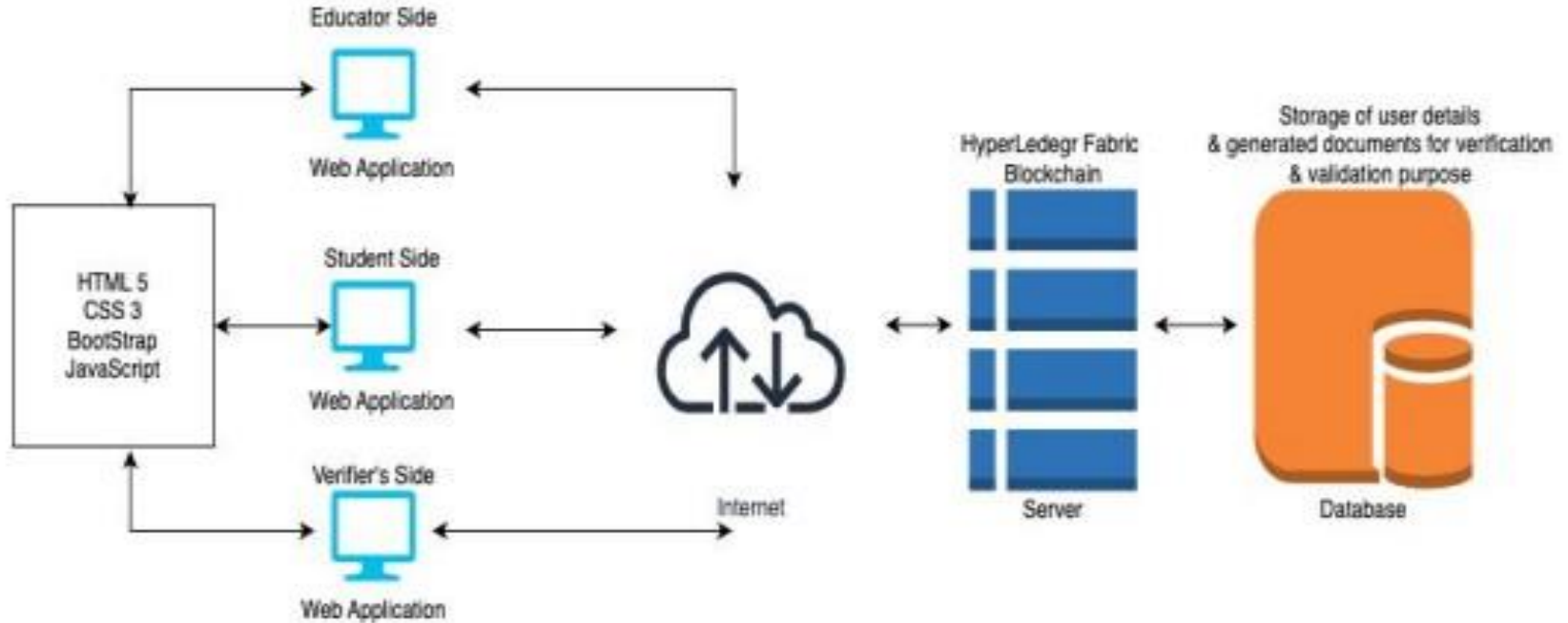
- Ethereum Blockchain
- Ganache
- Web 3.0
- MERN
- Cloud Infrastructure

1.7 Benefits for environment & Society

- By leveraging blockchain technology, these processes can be automated and made more cost-effective, saving time and resources for both issuing authorities and certificate holders.
- Moving certificate verification processes to blockchain can significantly reduce the consumption of paper and other physical resources associated with traditional methods.
- This contributes to environmental sustainability by minimizing deforestation, reducing energy consumption, and lowering carbon emissions associated with printing, shipping, and storing paper documents.
- Blockchain technology can help bridge the gap and promote inclusivity in education and workforce participation.

2. Project Design

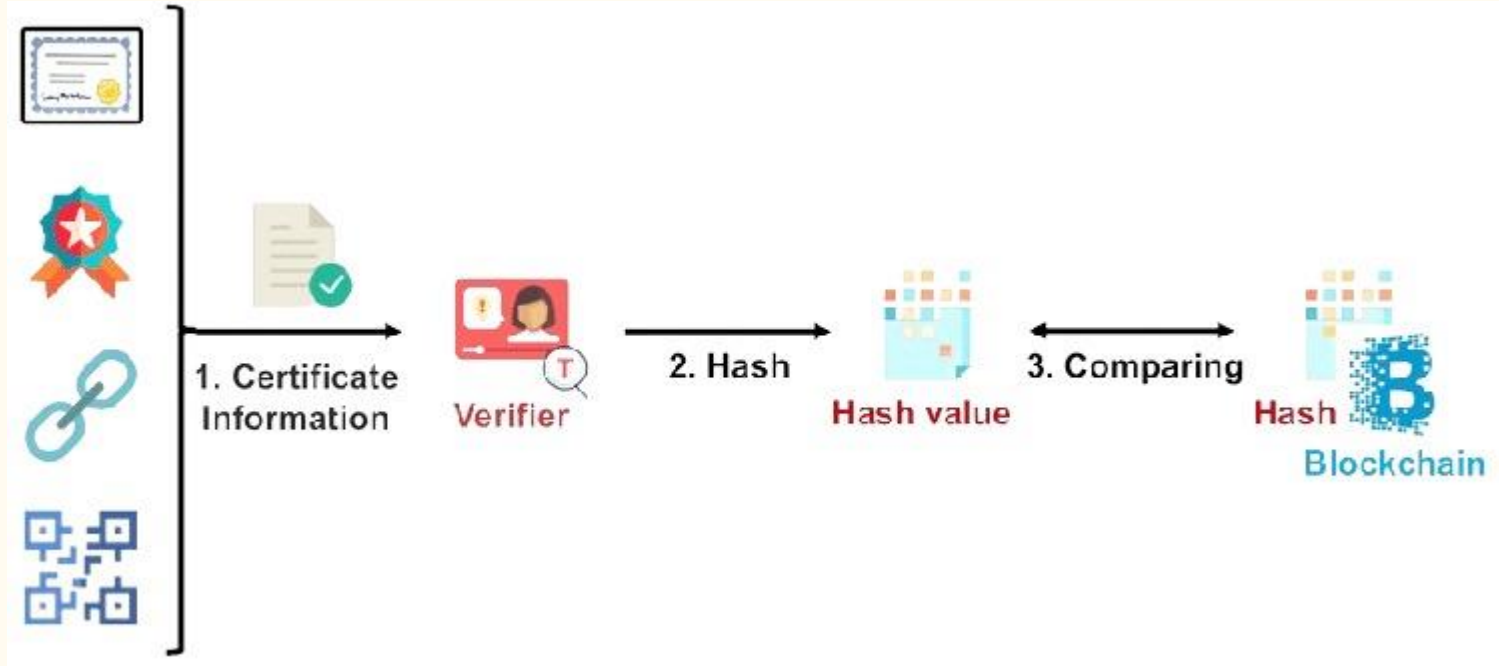
2.1 Proposed System



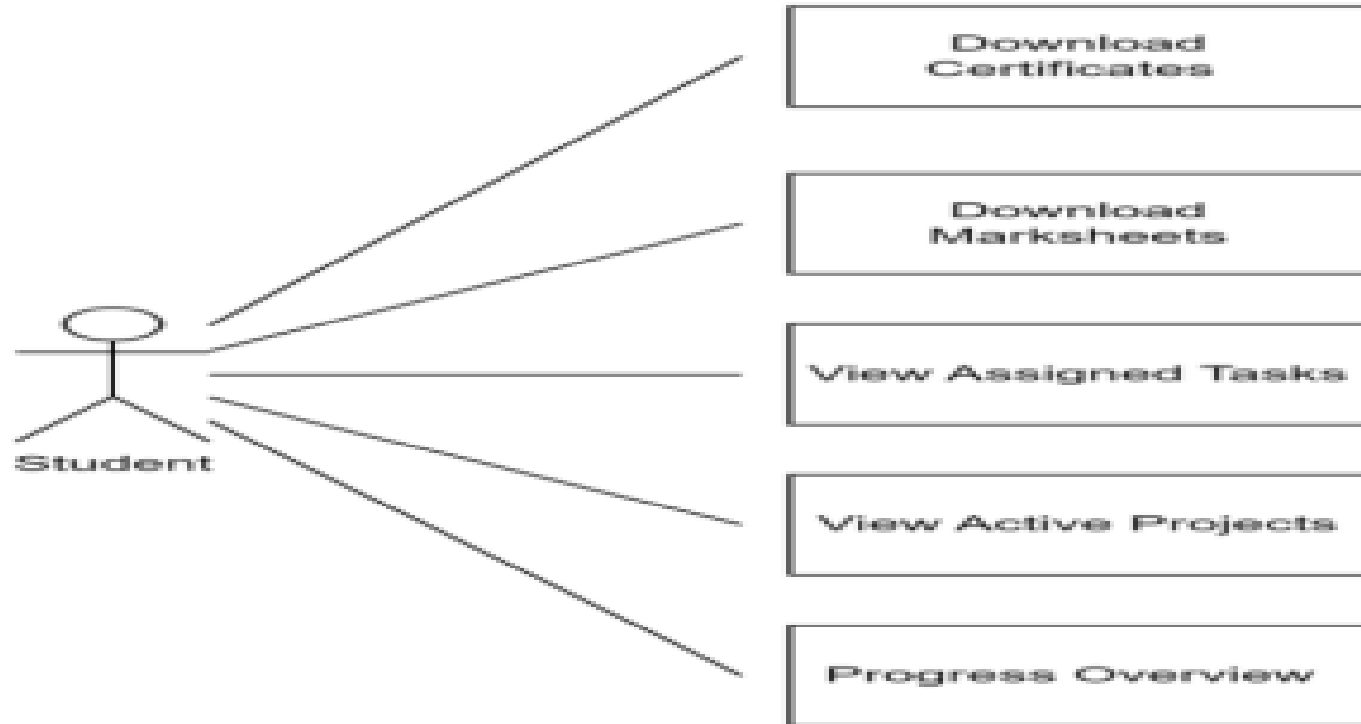
2.1 Proposed System

- The system involves three different user sides, namely Educator, Student, and Verifier.
- All user sides are connected through web applications that are developed using modern web technologies such as HTML 5, CSS 3, Bootstrap, and JavaScript.
- The users interact with the Ethereum Blockchain through the internet, which is hosted on a server that interacts with a database for storing user details and generated documents.
- The system is designed to enable Educators to create and issue certificates, students to receive and access certificates, and verifiers to verify and validate certificates.
- The system leverages smart contracts to implement the logic and rules for creating, issuing, verifying, validating, revoking, and renewing certificates.
- The database stores user details and generated documents, such as certificates, QR codes, and verification results.

2.2 Design(Flow Of Modules)

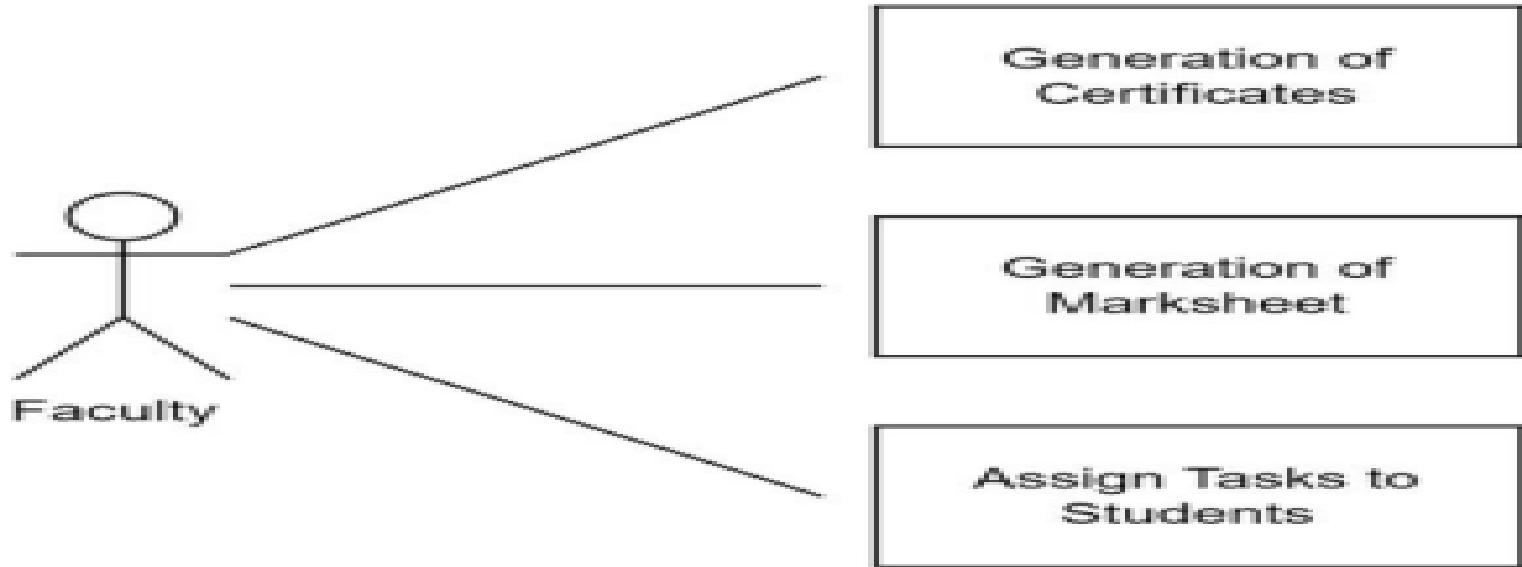


2.3 Description Of Use Case



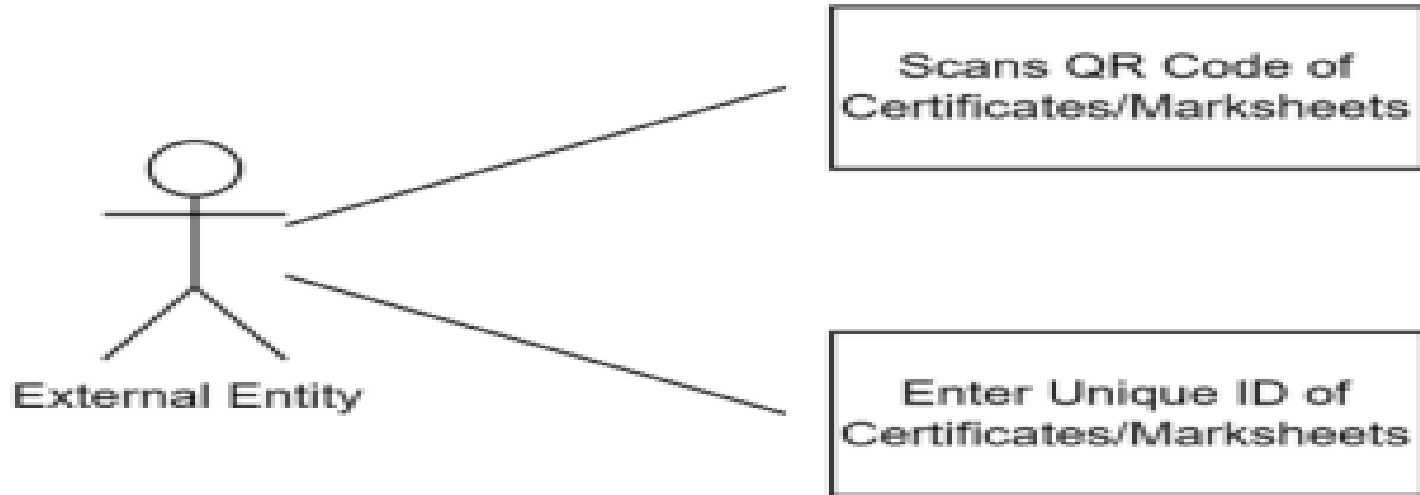
LEVEL 0

2.3 Description Of Use Case



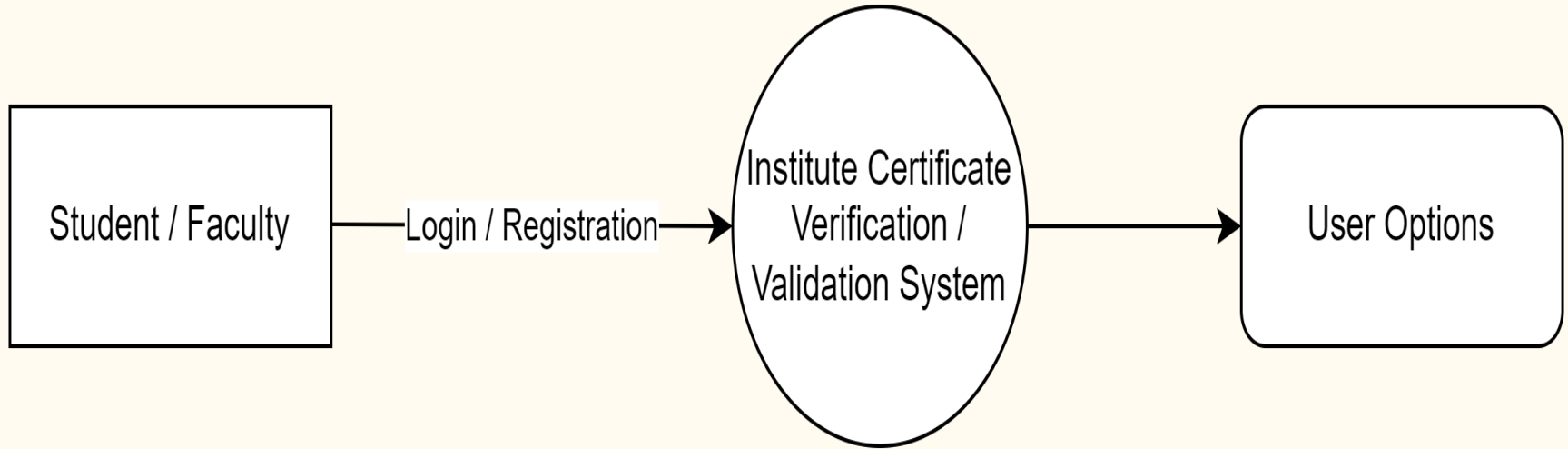
LEVEL 1

2.3 Description Of Use Case

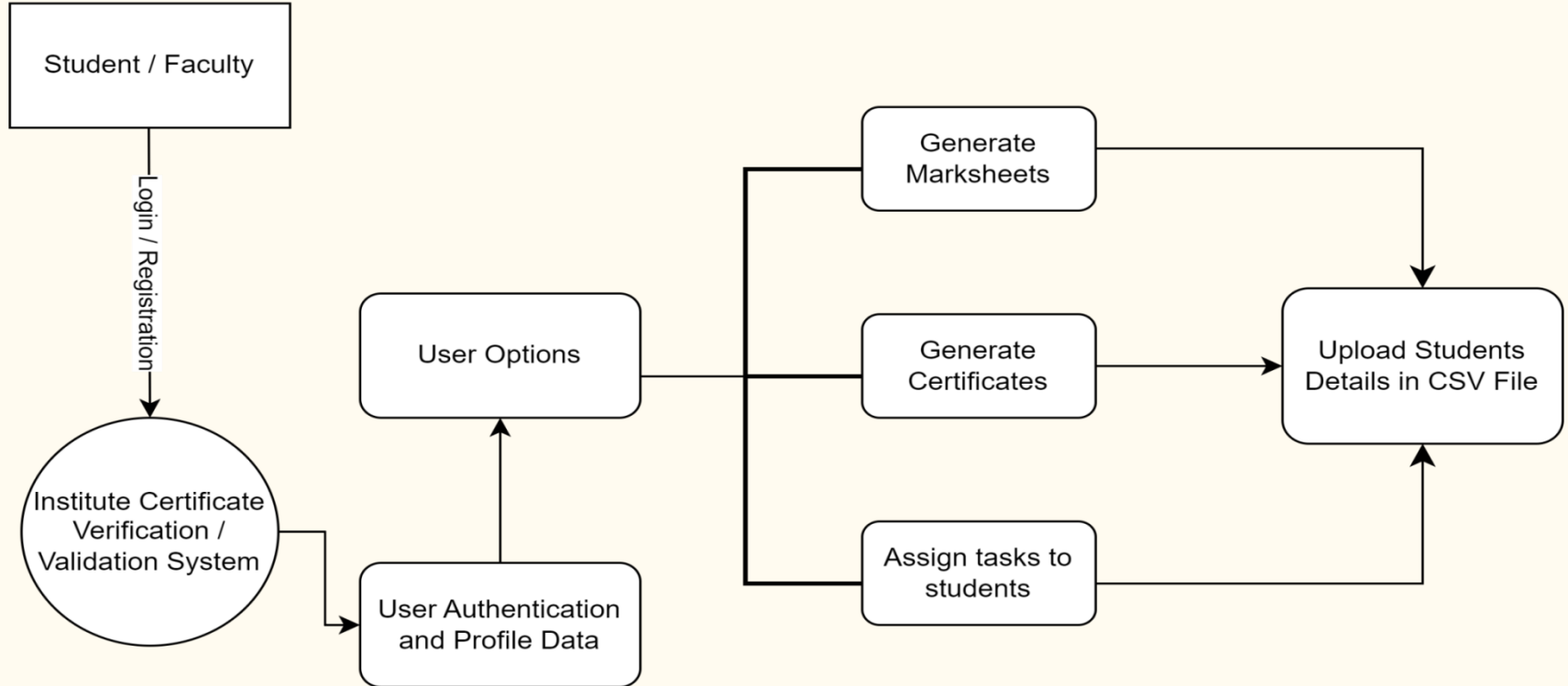


LEVEL 2

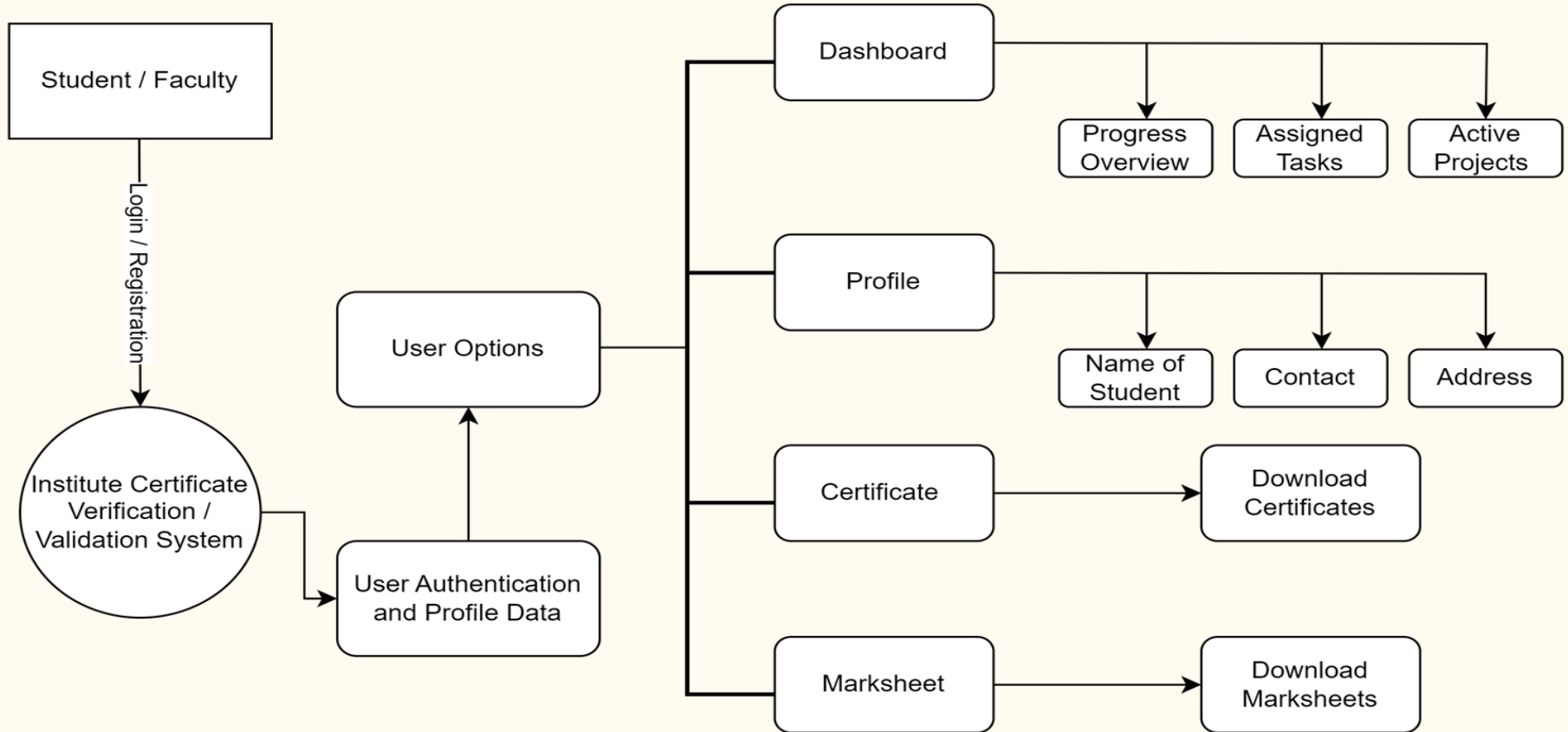
2.4 Activity diagram



2.4 Activity diagram



2.4 Activity diagram

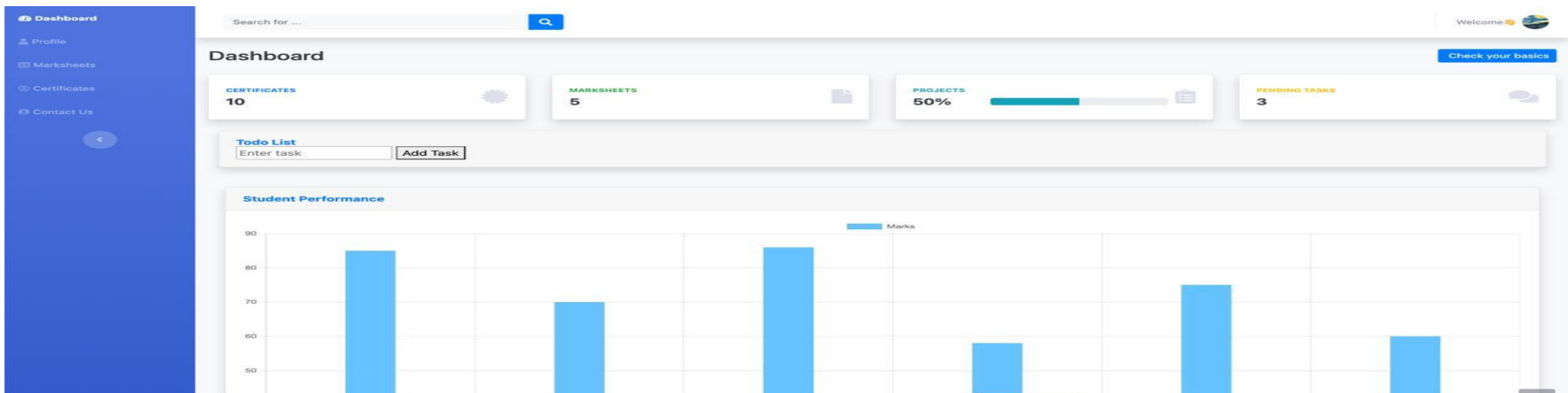


3. Implementation

3.1 Implementation Status

- Frontend UI done which includes the following:
 - ☐ Registration Page
 - ☐ Login Page
 - ☐ Certificate Generation Page
 - ☐ Marksheet Generation Page
 - ☐ A page for entering the unique ID of the certificate
 - ☐ QR code scanning page
- The blockchain-based implementation includes a set of transactions related to a student's exam performance, with each block containing a unique identifier, student information, exam details, timestamp, and previous block hash.
- Each block in the blockchain represents a specific exam or period, such as a semester, and has a unique block ID, timestamp, and reference to the previous block to maintain the chain.

4. Result



Tel: 28975737/38 Fax: 28973739 www.apu.edu.in

(ON BEHALF OF UNIVERSITY OF MUMBAI)

College Code : 996

NAME : Ambadas Malegave

EXAMINATION : Fourth Year Semester VII

HELD IN : Dec-23

SEAT NUMBER : 20104112

GRADE CARD

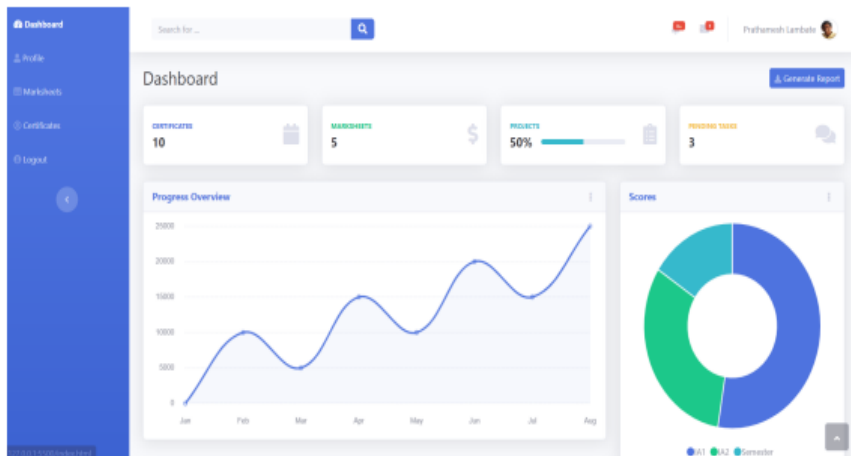
COURSE CODE	COURSE TITLE	COURSE CREDITS	GRADE			CREDIT EARNED (C) :	GRADE POINTS (G) :	C X G
			ISE/P/O/RIA/TWO	OVERALL				
ITC401	AI DS II	3	15	15	30	A	A	
ITC402	Internet of Everything	3	15	15	30	A	A	
ITC403	Infrastructure Security	3	15	15	30	A	A	
ITC404	Information Retrieval System	3	15	15	30	A	A	
ITC405	CyberSecurity and Laws	3	15	15	30	A	A	
IT401	Security Information Management	3	15	15	30	A	A	
IT402	VAPT Lab	3	15	15	30	A	A	
IT403	Data Science Lab	3	15	15	30	A	A	
IT404	IOE Lab	3	15	15	30	A	A	
ITM401	SAD Lab	3	15	15	30	A	A	
ITM401	ROSPL Lab	3						
TOTAL								

SGPI :

CGPI : 5.23

REMARK : Unsuccessful

RESULT DECLARED ON : 04-03-2024



Dashboard

Search for ...

Welcome

Profile

Profile

Change Photo

User Settings

Username: user.name

Institute Email Address: user@example.com

First Name: Santhak

Last Name: More

Save Settings

Contact Settings

Address

City

Country: India

Save Settings

Screenshot

Projects

Server migration: 20%

Sales tracking: 40%

Customer Database: 60%

Payment Details: 80%

Account setup: Complete!

Dashboard

Search for ...

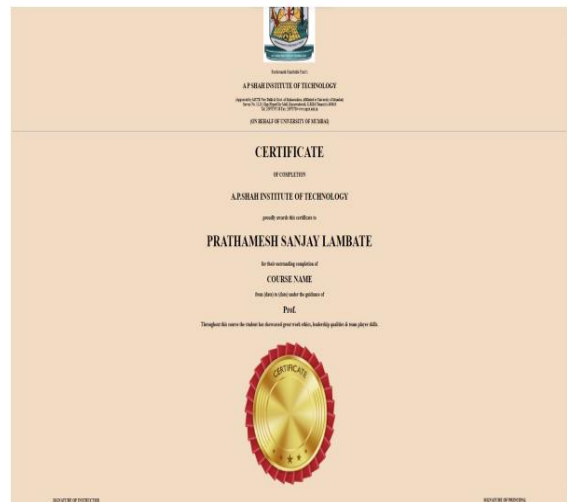
Prathamesh Lambate

My Marksheets

Marksheets

Show: 10

Name	Marksheet	
IA1 Sem 4	Click to View	2022/01/08
Semester 3	Click to View	2020/10/09
IA2 Sem 3	Click to View	2020/01/12
IA1 Sem 3	Click to View	2012/10/13
Semester 2	Click to View	2011/06/07
IA2 Sem 2	Click to View	2012/12/02
IA1 Sem 2	Click to View	2011/05/03
Semester 1	Click to View	2011/12/12



Autonomous Institute Since 2001

A.P. JEEVA INSTITUTE OF TECHNOLOGY

Approved by AICTE, The State Council of Higher Education, Government of Tamil Nadu, Coimbatore
Affiliated to Anna University, Coimbatore (Autonomous)

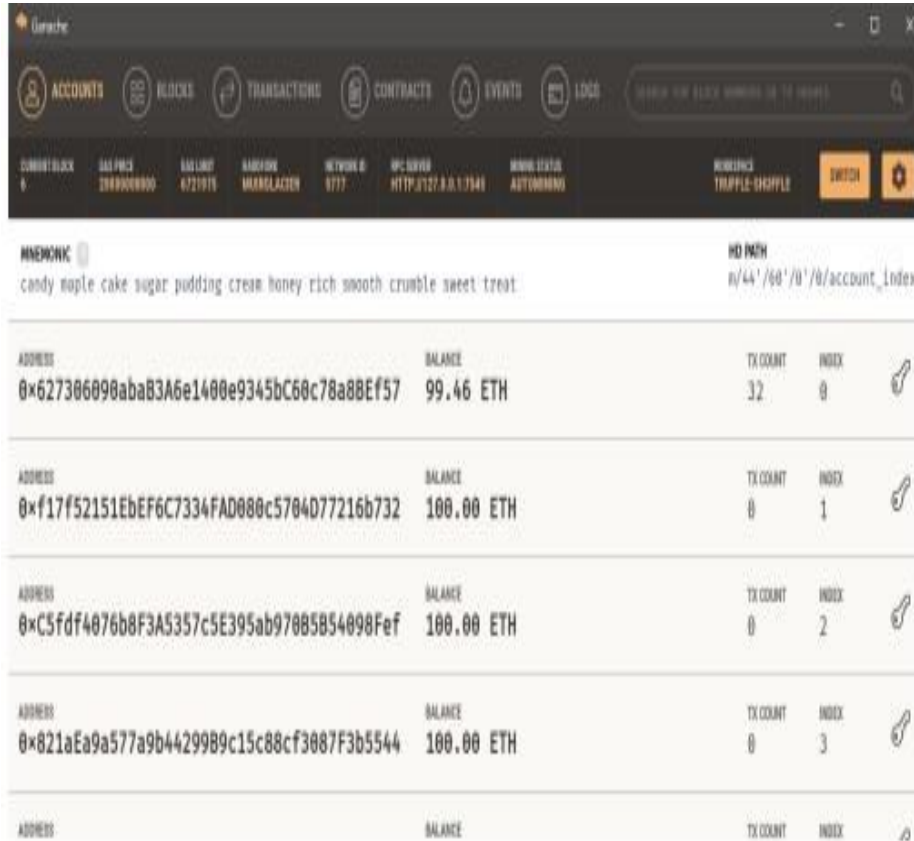
(AN AFFILIATE OF ANNA UNIVERSITY, COIMBATORE)

GRADE CARD

College Code: 001

NAME:
ENROLLMENT NO:
REG. NO:
ROLL NUMBER:

COURSE CODE	COURSE TITLE	COURSE CREDITS	COURSE GRADE	COURSE STATUS	COURSE TYPE
CE101					
CE102					
CE103					
CE104					
CE105					
CE106					
CE107					
CE108					
CE109					
CE110					
CE111					
CE112					
CE113					
CE114					
CE115					
CE116					
CE117					
CE118					
CE119					
CE120					
CE121					
CE122					
CE123					
CE124					
CE125					
CE126					
CE127					
CE128					
CE129					
CE130					
CE131					
CE132					
CE133					
CE134					
CE135					
CE136					
CE137					
CE138					
CE139					
CE140					
CE141					
CE142					
CE143					
CE144					
CE145					
CE146					
CE147					
CE148					
CE149					
CE150					
CE151					
CE152					
CE153					
CE154					
CE155					
CE156					
CE157					
CE158					
CE159					
CE160					
CE161					
CE162					
CE163					
CE164					
CE165					
CE166					
CE167					
CE168					
CE169					
CE170					
CE171					
CE172					
CE173					
CE174					
CE175					
CE176					
CE177					
CE178					
CE179					
CE180					
CE181					
CE182					
CE183					
CE184					
CE185					
CE186					
CE187					
CE188					
CE189					
CE190					
CE191					
CE192					
CE193					
CE194					
CE195					
CE196					
CE197					
CE198					
CE199					
CE200					
CE201					
CE202					
CE203					
CE204					
CE205					
CE206					
CE207					
CE208					
CE209					
CE210					
CE211					
CE212					
CE213					
CE214					
CE215					
CE216					
CE217					
CE218					
CE219					
CE220					
CE221					
CE222					
CE223					
CE224					
CE225					
CE226					
CE227					
CE228					
CE229					
CE230					
CE231					
CE232					
CE233					
CE234					
CE235					
CE236					
CE237					
CE238					
CE239					
CE240					
CE241					
CE242					
CE243					
CE244					
CE245					
CE246					
CE247					
CE248					
CE249					
CE250					
CE251					
CE252					
CE253					
CE254					
CE255					
CE256					
CE257					
CE258					
CE259					
CE260					
CE261					
CE262					
CE263					
CE264					
CE265					
CE266					
CE267					
CE268					
CE269					
CE270					
CE271					
CE272					
CE273					
CE274					
CE275					
CE276					
CE277					
CE278					
CE279					
CE280					
CE281					
CE282					
CE283					
CE284					
CE285					
CE286					
CE287					
CE288					
CE289					
CE290					
CE291					
CE292					
CE293					
CE294					
CE295					
CE296					
CE297					
CE298					
CE299					
CE300					
CE301					
CE302					
CE303					
CE304					
CE305					
CE306					
CE307					
CE308					
CE309					
CE310					
CE311					
CE312					
CE313					
CE314					
CE315					
CE316					
CE317					
CE318					
CE319					
CE320					
CE321					
CE322					
CE323					
CE324					
CE325					
CE326					
CE327					
CE328					
CE329					
CE330					
CE331					
CE332					
CE333					
CE334					
CE335					
CE336					
CE337					
CE338					
CE339					
CE340					
CE341					
CE342					
CE343					
CE344					
CE345					
CE346					
CE347					
CE348					
CE349					
CE350					
CE351					
CE352					
CE353					
CE354					
CE355					
CE356					
CE357					
CE358					
CE359					
CE360					
CE361					
CE362					
CE363					
CE364					
CE365					
CE366					
CE367					
CE368					
CE369					
CE370					
CE371					
CE372					
CE373					
CE374					
CE375					
CE376					
CE377					
CE378					
CE379					
CE380					
CE381					
CE382					
CE383					
CE384					
CE385					
CE386					
CE387					
CE388					
CE389					
CE390					
CE391					
CE392					
CE393					
CE394					
CE395					
CE396					
CE397					
CE398					
CE399					
CE400					
CE401					
CE402					
CE403					
CE404					
CE405					
CE406					
CE407					
CE408					
CE409					
CE410					
CE411					
CE412					
CE413					
CE414					
CE415					
CE416					
CE417					
CE418					
CE419					
CE420					
CE421					
CE422					
CE423					
CE424					
CE425					
CE426					
CE427					
CE428					
CE429					
CE430					
CE431					
CE432					
CE433					
CE434					
CE435					
CE436					
CE437					
CE438					
CE439					
CE440					
CE441					
CE442					
CE443					
CE444					
CE445					
CE446					
CE447					
CE448					
CE449					
CE450					
CE451					
CE452					
CE453					
CE454					
CE455					
CE456					
CE457					
CE458					
CE459					
CE460					



The screenshot shows the Ganache application window. At the top, there's a navigation bar with icons for Accounts, Blocks, Transactions, Contracts, Events, and Logs. Below this is a status bar displaying various network metrics like Current Block, Gas Price, Gas Limit, Network ID, RPC URL, and Mining Status. The main area displays a list of accounts under the 'ACCOUNTS' tab. Each account entry includes an address, a balance in ETH, a transaction count, and an index. The accounts are listed in a table format.

ADDRESS	BALANCE	TX COUNT	INDEX
0x627306090aba83A6e1400e9345bC60c78a88Ef57	99.46 ETH	32	0
0xf17f52151EbEf6C7334FAD080c5704D77216b732	100.00 ETH	0	1
0xC5fdF4076b0F3A5357c5E395ab97085854090FeF	100.00 ETH	0	2
0x821aEa9a577a9b4429989c15c88cf3087F3b5544	100.00 ETH	0	3

- The displayed image shows a certificate transaction that has been generated using the solidity program on the Ethereum platform.
- This type of transaction verifies ownership of a certificate or marksheet and enables secure asset exchange between two individuals.
- When a certificate transaction is stored on the Ethereum blockchain, it creates a permanent record.
- This record can be used to prove the trustworthiness of the Students in future transactions.
- Once verified, the transaction is permanently recorded and cannot be altered, ensuring a high level of security and trustworthiness for all parties involved.

5. Conclusion and Future Scope

5.1 Conclusion & Future Scope

- The implementation of a Comprehensive Certificate Validation and Verification System for Educational Institutes using Blockchain offers several compelling benefits.
- It significantly reduces the costs associated with manual certificate verification.
- The blockchain technology streamlines this process, saving institutions and organizations valuable time and resources.
- This not only safeguards the credibility of educational institutions but also protects the interests of employers and other stakeholders relying on accurate verification.
- It ensures easy access to and sharing of digital certificates, eliminating the risk of loss or damage.
- Students and graduates can conveniently access their credentials at any time, from anywhere, reducing the need for physical copies.
- With blockchain's ability to securely update and store records, institutions can easily correct any discrepancies, ensuring that certificates are accurate and reliable.

References

- [1] Smith, J. (2020). Blockchain Applications in Education: A Comprehensive Review. Journal of Educational Technology.
- [2] Hyperledger Fabric Documentation. (2022). Hyperledger Fabric: Getting Started Guide. Retrieved from <https://hyperledger-fabric.readthedocs.io/en/release-2.2/>.
- [3] Brown, M. (2018). Enhancing Certificate Security: A Multi-Factor Authentication Approach. Security Today.
- [4] White, R. (2018). Blockchain Governance and Compliance: A Guide for Modern Enterprises. Blockchain Today.
- [5] Zibin Zheng , Shaoan Xie, Hong-Ning Dai, Xiangping Chen , ” An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends”, IEEE 6th International Congress on Big Data, 2017.
- [6] Jiin-Chiou, Narn-Yih Lee, Chien Chi, YI-Hua Chen, “Blockchain and Smart Contract for Digital Certificate,” Proceedings of IEEE International Conference on Applied System Innovation 2018.

Thank You

