COURSE TITLE	**BLOCKCHAIN APPLICATION DEVELOPMENT**
COURSE CODE	**05FN0501**
COURSE CREDITS	**4**

Objective:

1 To understand the core principles of blockchain technology and decentralized systems.
2 To explore Ethereum architecture and the development of smart contracts using Solidity.
3 To design, develop and deploy decentralized applications (DApps).
4 To provide hands-on experience with blockchain development tools such as Ganache, Truffle, and MetaMask.
5 To implement real-world blockchain solutions in fintech applications.

Course Outcomes: After completion of this course, student will be able to:

1 Students will understand blockchain architecture and its relevance in FinTech.
2 Students will be able to write and deploy Solidity smart contracts on Ethereum.
3 Students will develop and integrate DApps using blockchain tools.
4 Students will explore FinTech applications of blockchain in real-world use cases.
5 Students will gain hands-on experience with Web3 frameworks and best practices for secure development.

Pre-requisite of course: Basic knowledge of Web Development and Programming Fundamentals

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	0	50

Contents : Unit	Topics	Contact Hours
1	**Introduction to Blockchain** Introduction to Blockchain, History of Blockchain, Blockchain Architecture, Distributed Ledger Technology (DLT), Consensus Mechanisms (PoW, PoS, PBFT), Public vs Private Blockchain, Blockchain Use-Cases in FinTech, Bitcoin and Ethereum Overview	11
2	**Ethereum and Smart Contracts** Ethereum Blockchain Structure, Gas and Transactions, Solidity Programming Language – Syntax, Data Types, Functions, Control Structures, Smart Contracts: Writing, Deploying and Testing, Solidity Events, Modifiers, Inheritance and Libraries	11

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Contents : Unit	Topics	Contact Hours
3	**DApp Development** Understanding DApps, Web3.js Fundamentals, Connecting Frontend with Smart Contracts, Ganache, Truffle Suite, Remix IDE, Using MetaMask for Ethereum Wallet Integration	11
4	**Real-World Blockchain Applications in FinTech** Blockchain in Banking, Insurance, Supply Chain & Crowdfunding, Token Standards – ERC-20, ERC-721, ERC-1155, Security and Challenges in Blockchain Development, Future Trends: DeFi, NFTs, CBDCs, Layer 2 Scaling Solutions	12
Total Hours		**45**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Unit1** Write a program to simulate a basic blockchain ledger using Python or JavaScript, Analyze and visualize the working of different consensus algorithms using simulation, Compare Ethereum and Bitcoin block structure and demonstrate with JSON format, Explore and document blockchain use cases in digital identity and trade finance, Write and deploy a basic smart contract in Solidity using Remix IDE, Develop a voting smart contract with modifiers and events, Implement inheritance and libraries in a smart contract, Create a contract for a simple cryptocurrency token (ERC-20)	15
2	**Unit 2** Connect a web frontend to Ethereum smart contracts using Web3.js, Use Ganache and Truffle to compile, migrate, and test smart contracts Integrate MetaMask wallet with your decentralized app, Build a full DApp for asset registry or crowdfunding, Design a blockchain use-case model for loan disbursement Implement a smart contract-based insurance policy with claim automation, Create an NFT contract and deploy it to testnet, Study and present DeFi platforms such as Uniswap or Aave	15
Total Hours		**30**

Textbook :

1 Mastering Blockchain, Imran Bashir, Packt Publishing, 2023

References:

1 Blockchain Basics: A Non-Technical Introduction in 25 Steps, Blockchain Basics: A Non-Technical Introduction in 25 Steps, Daniel Drescher, Apress, 2017

2 Introducing Ethereum and Solidity: Foundations of Cryptocurrency and Blockchain Programming for Beginners, Introducing Ethereum and Solidity: Foundations of Cryptocurrency and Blockchain Programming for Beginners, Chris Dannen, Apress, 2017

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References:

3 Blockchain Applications: A Hands-On Approach, Blockchain Applications: A Hands-On Approach, Arshdeep Bahga, Vijay Madisetti, VPT, 2017

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	15.00	25.00	25.00	25.00	0.00

Instructional Method:

1 Boardwork & PPT

Supplementary Resources:

1 Solidity Tutorial – Programming Hub
2 CryptoZombies – Interactive Solidity Learning
3 Ethereum Blockchain Explorer – Etherscan

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