

## SEMESTER S7

### BLOCKCHAIN AND CRYPTOCURRENCIES

<b>Course Code</b>	<b>PECST747</b>	<b>CIE Marks</b>	40
<b>Teaching Hours/Week (L: T:P: R)</b>	3:0:0:0	<b>ESE Marks</b>	60
<b>Credits</b>	3	<b>Exam Hours</b>	2 Hrs. 30 Min.
<b>Prerequisites (if any)</b>	PBCST604	<b>Course Type</b>	Theory

#### Course Objectives:

1. To provide a comprehensive understanding of blockchain architecture, elements, types (public, private, consortium), and industry applications.
2. To help the learners to assess strengths and weaknesses of various blockchain consensus mechanisms (e.g., Proof of Work, Proof of Stake, Practical Byzantine Fault Tolerance).
3. To enable learners to use blockchain real-world applications in government, healthcare, finance, and supply chain management, identifying implementation opportunities and challenges.

#### SYLLABUS

<b>Module No.</b>	<b>Syllabus Description</b>	<b>Contact Hours</b>
<b>1</b>	<b>Blockchain Fundamentals</b> Introduction, Blockchain Definition, Deciphering the Blockchain, Features and challenges of Blockchain, Applications in Blockchain, Decentralisation, Distributed Ledger Technology, Blockchain variants.	<b>7</b>
<b>2</b>	<b>Cryptography in Blockchain and Consensus Mechanisms</b> Concept of Hashing, Creating a Transaction Hash, Merkle Trees - Importance of Merkle tree, Chaining of Blocks, Building the Network, Accessing the network, Types of Wallets.  Need for Consensus, Two Generals' Problem, Byzantine Generals' Problem, Byzantine Fault Tolerance (BFT), Practical Byzantine Fault Tolerance (PBFT)- working, Paxos and Raft Algorithms.	<b>9</b>
<b>3</b>	<b>Cryptocurrencies - Bitcoin and Ethereum</b> Bitcoin: Components, Nodes in Bitcoin network, Transactions and memory	<b>10</b>

	<p>pools, Proof of Work-Mining Cryptocurrencies, Hard and Soft Forks, Tracking Bitcoins-Unspent Transaction Outputs.</p> <p>Ethereum: Transition from Bitcoin to Ethereum, Concept of Ethereum World Computer, Ethereum Virtual Machine, Ethereum Network, Transition from PoW to PoS- Working of PoS, Smart Contracts in Ethereum, Decentralised Applications in Ethereum, Tools used in Ethereum.</p>	
<b>4</b>	<p><b>Blockchain Ethereum Platform using Solidity and Use Cases in Blockchain :-</b></p> <p>Solidity Language - Remix IDE, Structure of a Smart Contract Program, Modifiers, Events, Functions, Inheritance, External Libraries, Error Handling.</p> <p>Permissioned Blockchains, Introduction to Hyperledger Foundation, Hyperledger Distributed Ledger frameworks, Hyperledger Fabric.</p> <p>Use Cases in Blockchain - Finance, Education, Government, Healthcare and Supply Chain Management.</p>	<b>10</b>

**Course Assessment Method  
(CIE: 40 marks, ESE: 60 marks)**

**Continuous Internal Evaluation Marks (CIE):**

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written )	Total
<b>5</b>	<b>15</b>	<b>10</b>	<b>10</b>	<b>40</b>

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

Part A	Part B	Total
<ul style="list-style-type: none"> <li>● 2 Questions from each module.</li> <li>● Total of 8 Questions, each carrying 3 marks</li> </ul> <p style="text-align: center;"><b>(8x3 =24 marks)</b></p>	<ul style="list-style-type: none"> <li>● Each question carries 9 marks.</li> <li>● Two questions will be given from each module, out of which 1 question should be answered.</li> <li>● Each question can have a maximum of 3 subdivisions.</li> </ul> <p style="text-align: center;"><b>(4x9 = 36 marks)</b></p>	<b>60</b>

## Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
<b>CO1</b>	Explain the fundamental concepts of Blockchain technology.	<b>K2</b>
<b>CO2</b>	Illustrate the cryptographic building blocks of Blockchain technology and understand the consensus mechanisms.	<b>K2</b>
<b>CO3</b>	Explain the concepts of cryptocurrency bitcoin, mining processes, and wallet management.	<b>K2</b>
<b>CO4</b>	Use the concepts of Ethereum platform and understand the use cases of blockchain technology	<b>K3</b>
<b>CO5</b>	Develop skills in designing and deploying simple applications using Solidity language.	<b>K3</b>

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

### CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	3	3									2
<b>CO2</b>	3	3	3									2
<b>CO3</b>	3	3	3									2
<b>CO4</b>	3	3	3		3							2
<b>CO5</b>	3	3	3	3	3							2

Note: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Blockchain Technology: Algorithms and Applications	Asharaf S, Sivadas Neelima, Adarsh S, Franklin John	Wiley	1/e, 2023
2	BlockchainTechnology	Chandramauoli Subrahmaniyan, Asha A George	Universities Press.	1/e ,2020

<b>Reference Books</b>				
<b>Sl. No</b>	<b>Title of the Book</b>	<b>Name of the Author/s</b>	<b>Name of the Publisher</b>	<b>Edition and Year</b>
1	Blockchain Technology - Concepts and Applications.	Kumar Saurabh, Ashutosh Saxena	Wiley	1/e, 2020
2	Mastering Blockchain	Imran Bashir	Packt Publishing	1/e, 2020
3	Solidity programming Essentials: A beginner's guide to build smart contracts for Ethereum and blockchain	Ritesh Modi	Packt Publishing	1/e, 2018.

<b>Video Links (NPTEL, SWAYAM...)</b>	
<b>Module No.</b>	<b>Link ID</b>
1	<a href="https://youtube.com/playlist?list=PLrKK422S1aMma8IDA2JJjEUUpC2ycuApuC&amp;si=1OXYDEZ4A5M8M4Q">https://youtube.com/playlist?list=PLrKK422S1aMma8IDA2JJjEUUpC2ycuApuC&amp;si=1OXYDEZ4A5M8M4Q</a>
2	<a href="https://youtube.com/playlist?list=PLHRLZtgrF2jl8yqucJsMFqh5XpRLTgCI4">https://youtube.com/playlist?list=PLHRLZtgrF2jl8yqucJsMFqh5XpRLTgCI4</a>
3	<a href="https://youtube.com/playlist?list=PL6gx4CwI9DGBrtyuJUiv9Lq5CAYpN8Gl">https://youtube.com/playlist?list=PL6gx4CwI9DGBrtyuJUiv9Lq5CAYpN8Gl</a>
4	<a href="https://youtube.com/playlist?list=PLWUCKsxdK10oksYr6IG_wRsaSUySQC0ck">https://youtube.com/playlist?list=PLWUCKsxdK10oksYr6IG_wRsaSUySQC0ck</a>