

SEMESTER S8

STORAGE SYSTEMS

(Common to CS/CM/CR/CD/AM/AD)

Course Code	PECST867	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. To provide a comprehensive understanding of storage technologies and architectures.
2. To empower students to design and implement effective storage solutions.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Storage technologies:- Computer storage technologies-Magnetic bubble memories, Charged Coupled Devices - CCDs, Micro-Electro-Mechanical Systems - MEMS, Flash memories, Processing In Memory - PIM, Optical storage - Data deduplication in storage systems. Storage Arrays- Architectural Principles, Replication, Local Snapshot Redundant Arrays of Independent Disks (RAID) - RAID0,RAID2,RAID3, RAID4, RAID5, RAID6, Hybrid RAID.	9
2	Data Storage Networking:- Fibre Channel SAN- FC SAN Components,SAN Topologies, iSCSI SAN- iSCSI names, Sessions, iSNS, Network Attached Storage - NAS Protocols, NAS Arrays, NAS Performance Object Storage - Objects and Object IDs, metadata, API Access	9
3	Business Continuity, Backup and Recovery:- Replication- Synchronous Replication, Asynchronous Replication Application, Layer Replication, Logical Volume Manager-Based Replication, Backup Methods- Hot Backups, Offline Backups, LAN-Based Backups, LAN-Free Backups (SAN Based), Serverless Backups, NDMP, Backup Types- Full Backups, Incremental Backups, Differential Backups ,	9

	Synthetic Full Backups, Application-Aware Backups	
4	Storage Management:- Capacity Management- Capacity Reporting, Thin Provisioning Considerations, Deduplication and Compression, Quotas and Archiving, Showback and Chargeback, Performance Management- Latency/Response Time, IOPS,MBps and Transfer Rate, Factors Affecting Storage Performance Management Protocols and Interfaces.	9

**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
5	15	10	10	40

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

Course Outcomes (COs)

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

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Describe emerging storage technologies.	K2
CO2	Compare and contrast different storage networking technologies.	K2
CO3	Understand the importance of business continuity.	K2
CO4	Develop a comprehensive backup and recovery strategy	K3
CO5	Utilize management tools and best practices to monitor, optimize, and secure storage resources, ensuring optimal performance and data integrity.	K3

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
CO1	3	3	2									3
CO2	3	3	2									3
CO3	3	3	3									3
CO4	3	3	3									3
CO5	3	3	3									3

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	Data Storage Networking	Nigel Poulton	WILEY	2/e, 2015
2	Computer Storage Fundamentals	Susanta Dutta	BPB Publication	1/e, 2018

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Storage Systems : Organization, Performance, Coding, Reliability, and Their Data Processing	Alexander Thomasian	Morgan Kaufmann	1/e, 2021
2	Information Storage and Management	Somasundaram Gnanasundaram Alok Shrivastava	Wiley	2/e, 2012

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://archive.nptel.ac.in/courses/106/108/106108058/