

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI**  
**INSTRUCTION DIVISION**  
**SECOND SEMESTER 2022-2023**  
Course Handout (Part II)

In addition to part-I (General handout for all courses appended to the timetable) this portion gives further specific details regarding the course:

**1. a) Course Number:** CS F446

b) Course Title: Data Storage Technologies and Networks

c) Instructors: **J.P. Mishra (IC)** (email: **jpm**)

**2. a) Objective:** To introduce the student to secondary storage technologies, algorithms and protocols for effective access of secondary storage, design and implementation issues for high performance storage over the network, and performance analysis as applicable.

**3. Text and Reference Books:**

**(a) Text Book:**

**T1.** Storage Networks: The complete Reference. Robert Spalding TMH.

**(b) References:**

**R1.** Computer Systems – A Programmer’s Perspective. Randall Bryant and David O’Hallaron. Pearson Education. 2003.

**R2.** IBM Redbooks on SAN, SAN Design and Storage Virtualization. (Available online)

**AR.** Additional references as assigned and made available by the instructors (Papers, Standards Documents and Datasheets).

**4. Course Plan**

Lecture No.s	Topic	Reading / Reference
1	Role of Data in Computing; Storage Requirements	T1. Ch. 1
2	Storage Models. Large Data Cases; Data Explosion; Data and Storage Characteristics.	AR
3-11	Network basics : Collision domain, Broadcast domain , network segmentation using Hub, bridge, Routers,. Switching modes, High availability network : STP	Class notes
12	Computer System Architecture – I/O: Buses, Design Issues and Typical Configurations.	AR
13 – 14	Hard Disks – Structure and Geometry, Addressing and Access Model. Access Time	R1. Ch 6
15	SCSI Protocol – Bus Features and State Transitions. Commands.	AR
16 – 17	Disk I/O Scheduling: Advanced Techniques. Performance Issues, Prefetching/Caching.	AR
18 – 19	Storage Design – Reliability and Redundancy. Performance: Data Transfer Rate vs. I/O Rate. Striping and Mirroring. Error Detection and Correction	AR

20 – 21	RAID –Levels and Performance. Parity Placement.	AR
22	RAID Controllers – Architecture, Caching and Destaging.	AR
23 – 24	Fibre Channel – Layered Architecture, Topologies, Classes of Service.	R2 T1. Ch 11
25 – 26	Fibre Channel – Addressing and Routing. High Performance Techniques.	R2 T1. Ch 11
27	Storage on the Network. Evolution. SAN vs. NAS	T1. Ch. 14
28 – 32	Fiber channel Protocol, encoding techniques , fabric services, zoning, trunking, multipathing , concept of LUN, ordered set, frames , sequence & exchange	R2
33	Types of san SAN Switches	AR
34 – 35	SAN Extensions and Emerging Protocols – IP SAN.	R4, AR
36	NAS – Structure and Components, NAS Servers and Configurations	T1. Ch 10
37 – 38	SAN design consideration	R4
39 – 40	Storage Architectures and Solutions. Data Centers – Issues, Techniques and Performance.	T1. Ch 14. AR

**4. Evaluation Scheme:**

Component	Type	Duration	Date&Time	Weight
Mid SEM	Closed Book	90 mins		35%
Term Paper	Take Home	2 to 3 weeks each	-	25%
Comprehensive Exam	Closed Book	3 Hrs	15/05 FN	40%

**5. Notices:**

All notices shall be displayed on CSIS notice Board.

**6. Chamber Consultation Hours:** TBA

Instructor-in-charge