Lovely Professional University, Punjab

Course Code	Course Title	Course Planner	Lectures	Tutorials	Practicals	Credits
CSE504	STORAGE TECHNOLOGY FOUNDATION	11179::Kewal Krishan	3	0	0	3

Course Weightage	ATT: 5 CA: 25 MTT: 20 ETT: 50	Exam Category: 14: Mid Term Exam: All MCQ – End Term Exam: MCQ + Subjective
Course Orientation	NA	

Course Outcomes :Through this course students should be able to

CO1 :: acquire knowledge about the growing data storage needs.

CO2 :: describe about EMC data storage products and solutions, software defined storage that efficiently store, protect and manage your information.

CO3 :: classify information storage and management in classic, virtualized and cloud environments which includes data center key elements, intelligent storage systems, storage networking technologies and various business continuity operations.

CO4 :: analyze about the ways to handle the challenges in storage industry ahead and to prepare the technical manpower which can handle the data storage equipments.

CO5 :: work on information storage and management technologies as per the requirement of industries.

CO6 :: prepare for Information Storage Associate Certification (EMCISA).

	TextBooks (T)		
Sr No	**Title**	**Author**	**Publisher Name**
T-1	INFORMATION STORAGE AND MANAGEMENT STORING, MANAGING, AND PROTECTING DIGITAL INFORMATION IN CLASSIC, VIRTUALIZED, AND CLOUD ENVIRONMENTS	EMC EDUCATION SERVICES	WILEY

	Reference Books (R)		
Sr No	**Title**	**Author**	**Publisher Name**
R-1	DATABASE CLOUD STORAGE: THE ESSENTIAL GUIDE TO ORACLE AUTOMATIC STORAGE MANAGEMENT	NITIN VENGURLEKAR, PRASAD BAGAL	MCGRAW HILL EDUCATION
R-2	INFORMATION STORAGE AND MANAGEMENT VERSION 3	EMC EDUCATION SERVICES	WILEY

Other Reading (OR)

Sr No	Journals articles as Compulsary reading (specific articles, complete reference)
OR-1	www.redbooks.ibm.com/redbooks/pdfs/sg245470.pdf ,
OR-2	http://www-03.ibm.com/systems/in/storage/services/ ,
OR-3	http://primera.eu/en/brochures/wp_ke_080816_uk.pdf ,
OR-4	http://www.tcs.com/SiteCollectionDocuments/White%20Papers/Business%20Continuity%20Planning.pdf ,
OR-5	https://education.emc.com/ISMbook/default.aspx ,

Relevant Websites (RW)

Sr No	(Web address) (only if relevant to the course)	Salient Features
RW-1	http://cloudstory.in/2012/04/introduction-to-big-data-hadoop-ecosystem-part-3/	It provides the introduction and advanced learning topics related to big data, hadoop and adoption of them in cloud
RW-2	http://blogs.gartner.com/thomas_bittman/2009/08/11/virtualizationunlockscloudcomputing/	Virtualization Unlocks Cloud Computing
RW-3	http://lass.cs.umass.edu/~shenoy/courses/spring07/lectures/Lec05.pdf	Different types of virtualization
RW-4	http://www.snia.org/education/storage_networking_primer/stor_devices/disk_drives	Disk Drives explained
RW-5	http://www.serialstoragewire.org/Articles/2007_09/schultz.html	Many Faces of SAS as Beyond the DAS Factor
RW-6	http://www.storagenetworks.com/writeups/strategies/iscsi-vs-fc/iscsi-vs-fc.php	Business Strategy Brief - iSCSI vs FC (Fibre Channel) SANs
RW-7	http://www.sans.org/reading_room/whitepapers/backup/fibre-channelstorageareanetworks- analysis-security-perspective_32913	FC SANs
RW-8	http://cloud.dzone.com/articles/introduction-cloud-computing	Introduction to Cloud Computing Characteristics and Service/Deployment Models
RW-9	http://www.storagesearch.com/datalink-nasbackup-art-2.pdf	NAS BACKUP
RW-10	http://hadoop.apache.org/	Apache Hadoop
RW-11	https://wiki.archlinux.org/index.php/RAID	RAID Implementation
RW-12	http://storagesanbasic.blogspot.in/2012/05/intelligent-storage-device.html	Intelligent Storage System
RW-13	http://storagesanbasic.blogspot.in/	Storage Basics
RW-14	http://www.computerweekly.com/feature/Backup-vs-replication-snapshots-CDP-in-data-protection-strategy	Replication
RW-15	http://www.computerweekly.com/feature/Remote-replication-Comparing-data-replication-methods	Remote Repllication
RW-16	https://www.usenix.org/legacy/publications/library/proceedings/fast02/full_papers/riedel/riedel_html/index.html	Storage Security
RW-17	https://www.emc.com/collateral/emc-perspective/h2159-managing-storage-ep.pdf	Managing Storage Infrastructure

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RW-18	https://www.ibm.com/cloud-computing/what-is-cloud-computing	Cloud Computing Basics
RW-19	https://www.emc.com/en-us/storage/software-defined-storage/index.htm	Software defined Storage

Software/Equipments/Databases

Sr No	(S/E/D) (only if relevant to the course)	Salient Features
SW-1	Navisphere Simulator	A simulator used to showcase the internal working of storage arrays in the networked environment. Students will get hands-on experience
SW-2	Control Center	A Dataceneter Management Suite is a simulator which provides the insight into datacenter operations and activities

LTP week distribution: (LTP Weeks)	
Weeks before MTE	7
Weeks After MTE	7
Spill Over (Lecture)	7

Detailed Plan For Lectures

Week Number	Lecture Number	Broad Topic(Sub Topic)	Chapters/Sections of Text/reference books	Other Readings, Relevant Websites, Audio Visual Aids, software and Virtual Labs	Lecture Description	Learning Outcomes	Pedagogical Tool Demonstration/ Case Study / Images / animation / ppt etc. Planned	Live Examples
Week 1	Lecture 1	Storage System : Introduction to Information Storage and Management (Digital data, Types of Data, Big Data, Information, Storage, Evolution of Storage Technology & Architecture)	T-1 R-2	RW-1	L1- Delivery of Lecture Zero L2- Definition of the data and its subsystem,Storage evolution, Big data basics	Student will be able to learn the concept of data and big data	Video lectures, demonstration using data center videos	Video depicting huge growth in data across the globe can be shown to the students
	Lecture 2	Storage System : Introduction to Information Storage and Management (Digital data, Types of Data, Big Data, Information, Storage, Evolution of Storage Technology & Architecture)	T-1 R-2	RW-1	L1- Delivery of Lecture Zero L2- Definition of the data and its subsystem,Storage evolution, Big data basics	Student will be able to learn the concept of data and big data	Video lectures, demonstration using data center videos	Video depicting huge growth in data across the globe can be shown to the students

Week 1	Lecture 3	Storage System : Introduction to Information Storage and Management (Data Center Infrastructure, Key Characteristics of data Center, Evolution of Computing Platforms, Compute systems and compute virtualization, Software defined data center)	T-1 R-2	RW-13 SW-2	Applications running in data center,Compute and desktop virtualization, Key Characteristics of data Center	Students will be able to understand the data center technologies	Peer to peer discussion and explanation using slide shows	
Week 2	Lecture 4	Storage System : Introduction to Information Storage and Management (Data Center Infrastructure, Key Characteristics of data Center, Evolution of Computing Platforms, Compute systems and compute virtualization, Software defined data center)	T-1 R-2	RW-13 SW-2	Applications running in data center,Compute and desktop virtualization, Key Characteristics of data Center	Students will be able to understand the data center technologies	Peer to peer discussion and explanation using slide shows	
	Lecture 5	Third Platform Technologies (Cloud computing and its essential characteristics)	T-1 R-1 R-2	RW-2 RW-18	Cloud computing basics, Cloud deployment methods, services	Students will learn about cloud types and their usage across the domains	Peer to peer and case based discussion.	Google, Amazon, Gmail
		Third Platform Technologies (Cloud services and cloud deployment models)	T-1 R-1 R-2	RW-2 RW-18	Cloud computing basics, Cloud deployment methods, services	Students will learn about cloud types and their usage across the domains	Peer to peer and case based discussion.	Google, Amazon, Gmail
	Lecture 6	Third Platform Technologies (Big data analytics, Social networking and mobile computing)	R-2	OR-3 RW-10	Big data analytics, Social networking and mobile computing, Characteristics of third platform infrastructure	Students will learn about big data analytics, Social networking and mobile computing basics	Peer to peer discussion and explanation using slide shows	data analytics applications like snowflake, trivago etc
		Third Platform Technologies (Characteristics of third platform infrastructure, Imperatives for third platform transformation)	R-2	OR-3 RW-10	Big data analytics, Social networking and mobile computing, Characteristics of third platform infrastructure	Students will learn about big data analytics, Social networking and mobile computing basics	Peer to peer discussion and explanation using slide shows	data analytics applications like snowflake, trivago etc
Week 3	Lecture 7	Third Platform Technologies (Big data analytics, Social networking and mobile computing)	R-2	OR-3 RW-10	Big data analytics, Social networking and mobile computing, Characteristics of third platform infrastructure	Students will learn about big data analytics, Social networking and mobile computing basics	Peer to peer discussion and explanation using slide shows	data analytics applications like snowflake, trivago etc

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Week 3	Lecture 7	Third Platform Technologies (Characteristics of third platform infrastructure, Imperatives for third platform transformation)	R-2	OR-3 RW-10	Big data analytics, Social networking and mobile computing, Characteristics of third platform infrastructure	Students will learn about big data analytics, Social networking and mobile computing basics	Peer to peer discussion and explanation using slide shows	data analytics applications like snowflake, trivago etc
	Lecture 8	Storage System Environment and Data Protection(Disk Drive Components, Disk Drive Performance, Key I/O characteristics of an application, Application virtualization, File system mapping, LVM, Compute and Desktop Virtualization)	T-1 R-2	RW-4 RW-11	Disk Drive Components, disk performance metrics	Students will learn about disk configuration and its performance	Video lectures, demonstration using disk drive videos	Spinning of disks and reading/writing processes can be demonstrated to the students.
	Lecture 9	Storage System Environment and Data Protection(Laws governing the Disk Performance, Compare I/O controller utilization and response time, and storage design based on application requirements)	T-1 R-2	RW-6	Disk utilization laws and response time, RAID implementation anf flash drives	Students will learn about the disk basics and response time considerations as well as RAID and solid state drives	Case based discussions and explanation using slide shows	Animations can be shown to the students depicting working of disks.
		Storage System Environment and Data Protection(RAID array Components, RAID implementation methods, RAID Comparison, Hot Spares)	T-1 R-2	RW-6	Disk utilization laws and response time, RAID implementation anf flash drives	Students will learn about the disk basics and response time considerations as well as RAID and solid state drives	Case based discussions and explanation using slide shows	Animations can be shown to the students depicting working of disks.
		Storage System Environment and Data Protection(Flash drives, Solid state drives)	T-1 R-2	RW-6	Disk utilization laws and response time, RAID implementation anf flash drives	Students will learn about the disk basics and response time considerations as well as RAID and solid state drives	Case based discussions and explanation using slide shows	Animations can be shown to the students depicting working of disks.
Week 4	Lecture 10	Storage System Environment and Data Protection(Laws governing the Disk Performance, Compare I/O controller utilization and response time, and storage design based on application requirements)	T-1 R-2	RW-6	Disk utilization laws and response time, RAID implementation anf flash drives	Students will learn about the disk basics and response time considerations as well as RAID and solid state drives	Case based discussions and explanation using slide shows	Animations can be shown to the students depicting working of disks.

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Week 4	Lecture 10	Storage System Environment and Data Protection(RAID array Components, RAID implementation methods, RAID Comparison, Hot Spares)	T-1 R-2	RW-6	Disk utilization laws and response time, RAID implementation anf flash drives	Students will learn about the disk basics and response time considerations as well as RAID and solid state drives	Case based discussions and explanation using slide shows	Animations can be shown to the students depicting working of disks.
		Storage System Environment and Data Protection(Flash drives, Solid state drives)	T-1 R-2	RW-6	Disk utilization laws and response time, RAID implementation anf flash drives	Students will learn about the disk basics and response time considerations as well as RAID and solid state drives	Case based discussions and explanation using slide shows	Animations can be shown to the students depicting working of disks.
	Lecture 11	Intelligent Storage System (Storage Tiering and Cache Tiering, Traditional and virtual storage provisioning, LUN expansion, and LUN Masking)	T-1 R-2	OR-1 SW-1	Storage and cache tiering, levels of usage	Students will learn about the basics of storage and server based cache tiering and its usage	Peer to peer discussion and explanation using slide shows	LUN provisioning can be demonstrated using EMC's live simulators
	Lecture 12	Intelligent Storage System (Server flash-caching technology, back end, physical disks and Disk Drive Interfaces, Components of an Intelligent Storage System, front end, and cache operation and management, Types of Intelligent storage systems, Scale up and Scale out storage architecture)	T-1 R-2	RW-12	Intelligent storage systems and their implementation in real world	Students will learn about the data center configurations and their usage and Components of an Intelligent Storage System	Video lectures, demonstration using server/arrays videos	Animations for Intelligent storage system can be shown
Week 5	Lecture 13				Test 1			
	Lecture 14	Storage Area Network(Fibre Channel Architecture, Zoning, Fibre Channel Login Types, Fibre Channel, Components of SAN, FC connectivity, Fibre Channel Ports)	T-1 R-2	RW-7	FC SAN and its components, where they are used and how they are used Zoning in SAN, how data can be protected and assigned to different users	Students will be able to learn about SAN and its artifacts Students will learn to apply security to data and users across zones	Peer to peer discussion and explanation using slide shows	Working of FC SAN's can be demonstrated using CISCO's online services
	Lecture 15	Storage Area Network(FC topologies, Organization of FC data, Virtual SAN, Block Level Virtualization)	T-1 R-2	RW-7	FC topologies, Block level virtualization in SAN and its configuration	Students will understand the basics of Block virtualization and its importance	Peer to peer discussion and explanation using slide shows	

Week 5	Lecture 15	Storage Area Network (SAN/NAS Capacity Management)	T-1 R-2	RW-7	FC topologies, Block level virtualization in SAN and its configuration	Students will understand the basics of Block virtualization and its importance	Peer to peer discussion and explanation using slide shows	
Week 6	Lecture 16	ISCSI, FCIP and Network Attached Storage(iSCSI names, FCIP protocol, and FICP protocol stack, Components of FCoE, Components of iSCSI, host connectivity options, and ISCSI topologies, Protocol stack)	T-1 R-2	OR-1 OR-2 RW-13 RW-6 RW-7	ISCSI and its usage in the data center, topologies of ISCSI	Students will be able to define ISCSI protocol and its attributes	Peer to peer and case based discussion. Explanation using slide shows	
		ISCSI, FCIP and Network Attached Storage(FCoE frame mapping, and Converged Enhanced Ethernet, General purpose Servers v/s NAS Devices)	T-1 R-2	OR-1 OR-2 RW-13 RW-6 RW-7	ISCSI and its usage in the data center, topologies of ISCSI	Students will be able to define ISCSI protocol and its attributes	Peer to peer and case based discussion. Explanation using slide shows	
	Lecture 17	ISCSI, FCIP and Network Attached Storage(iSCSI names, FCIP protocol, and FICP protocol stack, Components of FCoE, Components of iSCSI, host connectivity options, and ISCSI topologies, Protocol stack)	T-1 R-2	OR-1 OR-2 RW-13 RW-6 RW-7	ISCSI and its usage in the data center, topologies of ISCSI	Students will be able to define ISCSI protocol and its attributes	Peer to peer and case based discussion. Explanation using slide shows	
		ISCSI, FCIP and Network Attached Storage(FCoE frame mapping, and Converged Enhanced Ethernet, General purpose Servers v/s NAS Devices)	T-1 R-2	OR-1 OR-2 RW-13 RW-6 RW-7	ISCSI and its usage in the data center, topologies of ISCSI	Students will be able to define ISCSI protocol and its attributes	Peer to peer and case based discussion. Explanation using slide shows	
	Lecture 18	ISCSI, FCIP and Network Attached Storage(NAS File Sharing Protocols, NAS I/O Operations, Factors affecting NAS Performance & Availability, NAS Benefits, NAS File I/O, NAS Components, NAS Implementation)	T-1 R-2	OR-5 RW-3 RW-5 RW-7 RW-9 RW-13	FCIP vs IFCP conductivities, their implementation and NAS implementation with its components	Students will be able to understand the difference between ISCSI, FCIP and IFCP, NAS configuration methods	Peer to peer and case based discussion.	Cisco's demo videos can be shown

Week 6	Lecture 18	ISCSI, FCIP and Network Attached Storage(File Level Virtualization)	T-1 R-2	OR-5 RW-3 RW-5 RW-7 RW-9 RW-13	FCIP vs IFCP conductivities, their implementation and NAS implementation with its components	Students will be able to understand the difference between ISCSI, FCIP and IFCP, NAS configuration methods	Peer to peer and case based discussion.	Cisco's demo videos can be shown
Week 7	Lecture 19	ISCSI, FCIP and Network Attached Storage(NAS File Sharing Protocols, NAS I/O Operations, Factors affecting NAS Performance & Availability, NAS Benefits, NAS File I/O, NAS Components, NAS Implementation)	T-1 R-2	OR-5 RW-3 RW-5 RW-7 RW-9 RW-13	FCIP vs IFCP conductivities, their implementation and NAS implementation with its components	Students will be able to understand the difference between ISCSI, FCIP and IFCP, NAS configuration methods	Peer to peer and case based discussion.	Cisco's demo videos can be shown
		ISCSI, FCIP and Network Attached Storage(File Level Virtualization)	T-1 R-2	OR-5 RW-3 RW-5 RW-7 RW-9 RW-13	FCIP vs IFCP conductivities, their implementation and NAS implementation with its components	Students will be able to understand the difference between ISCSI, FCIP and IFCP, NAS configuration methods	Peer to peer and case based discussion.	Cisco's demo videos can be shown

SPILL OVER

Week 7	Lecture 20				Spill Over			
	Lecture 21				Spill Over			

MID-TERM

Week 8	Lecture 22	Block-based Storage System (Components of block-based storage system, Storage provisioning and storage tiering)	R-2	RW-13 RW-18	Components of block-based storage system and Storage provisioning and tiering	Students will be able to understand the concept of block based storage system and Storage provisioning	Peer to peer and case based discussion	
	Lecture 23	Software-defined Storage (Attributes of software-defined storage, Architecture of software-defined storage)	R-2	RW-19	software-defined storage architecture and functions	Students will be able to understand about Software-defined Storage in details	Peer to peer and case based discussion	
		Software-defined Storage (Functions of the control plane, Software-defined storage extensibility)	R-2	RW-19	software-defined storage architecture and functions	Students will be able to understand about Software-defined Storage in details	Peer to peer and case based discussion	

Week	Lecture	Topic		References	Subtopics/Content	Learning Outcomes	Methodology	Additional
Week 8	Lecture 24	Object and Content Based Storage(Compare traditional and object-based storage model, key components of OSD, Comparison of hierarchical file system and flat address space)	T-1 R-2	OR-2 RW-13	File systems used for storing the data across systems, object based storage	Students will learn about the basics of file systems and object storage	Case based discussions and explanation using slide shows	OSD models of yahoo and windows azure can be shown to the students
Week 9	Lecture 25	Object and Content Based Storage(Storage and retrieval process in OSD, CAS, components of unified storage)	T-1 R-2	OR-2 RW-13 RW-18 RW-8	CAS model for archiving the data across domains Unified storage model for the cloud and data centers	Students will be able to understand the concept of CAS and its components Students will learn about its basics and its configuration	Case based discussions and explanation using visuals	
		Object and Content Based Storage(Data access from unified storage)	T-1 R-2	OR-2 RW-13 RW-18 RW-8	CAS model for archiving the data across domains Unified storage model for the cloud and data centers	Students will be able to understand the concept of CAS and its components Students will learn about its basics and its configuration	Case based discussions and explanation using visuals	
	Lecture 26	Object and Content Based Storage(Storage and retrieval process in OSD, CAS, components of unified storage)	T-1 R-2	OR-2 RW-13 RW-18 RW-8	CAS model for archiving the data across domains Unified storage model for the cloud and data centers	Students will be able to understand the concept of CAS and its components Students will learn about its basics and its configuration	Case based discussions and explanation using visuals	
		Object and Content Based Storage(Data access from unified storage)	T-1 R-2	OR-2 RW-13 RW-18 RW-8	CAS model for archiving the data across domains Unified storage model for the cloud and data centers	Students will be able to understand the concept of CAS and its components Students will learn about its basics and its configuration	Case based discussions and explanation using visuals	
	Lecture 27	Business Continuity, Backup and Recovery(Information Availability, BC Terminology, BC Planning Lifecycle, Failure Analysis, Business Impact Analysis)	T-1 R-2	OR-4 OR-5 RW-9	Business continuity plan and its process, Backup to tapes, backup to disks, backup to virtual tapes, data deduplication methods,Backup Topologies, Backup in NAS Environment, Backup Technologies	Students will be able to define the BC plan and its implementation as well as Backup in NAS scenario, backup technologies to be used in there	Case based discussions and explanation using slide shows	

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Week	Lecture	Topic			Learning Outcome	Pedagogical Tool	
Week 9	Lecture 27	Business Continuity, Backup and Recovery(Backup to tapes, backup to disks, backup to virtual tapes, data deduplication methods,Backup Topologies, Backup in NAS Environment, Backup Technologies)	T-1 R-2	OR-4 OR-5 RW-9	Business continuity plan and its process, Backup to tapes, backup to disks, backup to virtual tapes, data deduplication methods,Backup Topologies, Backup in NAS Environment, Backup Technologies	Students will be able to define the BC plan and its implementation as well as Backup in NAS scenario, backup technologies to be used in there	Case based discussions and explanation using slide shows
Week 10	Lecture 28	Business Continuity, Backup and Recovery(Architecture, Granularity, Considerations, Methods, Process, Backup and Restore Operations, BC Technology Solutions, Continuous data protection (CDP), Backup Purpose)	T-1 R-2		BIA tools and the process, CDP methods and procedures	Students will be able to understand the concept of BIA and its applicability, the CDP process	Case based discussions and explanation using navisphere simulator
		Business Continuity, Backup and Recovery(Data deduplication implementations, Backup approaches in virtualized Environment)	T-1 R-2		BIA tools and the process, CDP methods and procedures	Students will be able to understand the concept of BIA and its applicability, the CDP process	Case based discussions and explanation using navisphere simulator
	Lecture 29				Test 2		
	Lecture 30	Replication(Local replication technologies, restore & restart considerations, creating multiple replicas, Local Replication at Source & Target, uses, data consistency, local replication technologies)	T-1 R-2	OR-5 RW-14	Local replication in virtual infra, how to create multiple replicas	Students will be able to define and use the local replication methosds and their implementation	Case based discussions and explanation using nevisphere simulator
Week 11	Lecture 31	Replication(CDP, local replication in virtualized environment, management interface)	T-1 R-2	RW-13 RW-14	Replication and its types,local replication technologies and Local replication in virtual infra, how to create multiple replicas	Students will be able to define and use the local replication methods and their implementation	Case based discussions and explanation using nevisphere simulator

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Week 11	Lecture 32	Replication(Remote Replication Technologies, CDP remote replication, Case Study of EMC Snapview, modes of remote replication)	T-1 R-2	OR-5 RW-15	Remote replication types and modes, remote technologies, three site replication. Students will learn about migration and replication stregies, their usage, configuration and implementation	Students will be able to define remote. Students will learn about cloud computing and its characteristics	Case based discussions and explanation using nevisphere simulator	
	Lecture 33	Replication(Remote replication/migration in virtualized environment)	T-1 R-2	RW-14 RW-15	Remote replication types and modes, remote technologies, three site replication. Students will learn about migration and replication strategies, their usage, configuration and implementation as well as DRaaS	Students will be able to define remote replication. Students will learn about cloud computing and its characteristics	Case based discussions and explanation using nevisphere simulator.	
		Replication(Disaster Recovery as a Service (DRaaS))	T-1 R-2	RW-14 RW-15	Remote replication types and modes, remote technologies, three site replication. Students will learn about migration and replication strategies, their usage, configuration and implementation as well as DRaaS	Students will be able to define remote replication. Students will learn about cloud computing and its characteristics	Case based discussions and explanation using nevisphere simulator.	
Week 12	Lecture 34	Storage Security and Management(Storage Security Framework, Risk Triad, Storage Security Domains)	T-1 R-2	OR-5 RW-16	Security framework in data center scenario and virtual framework, security domains in data center	students will be able to define the storage security domains and their applicability in the infrastructure	Case based discussions and demonstration using visuals	

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Week	Lecture	Topic			Learning Outcome	Objective	Pedagogical Tool	
Week 12	Lecture 35	Storage Security and Management(Network firewalls, security implementation in IP SAN, Security Implementations in Storage Networking, Kerberos)	T-1 R-2	RW-7	Security aspects in cloud and virtual world, different techniques to be used for them	Students will be able to define and implement the cloud and virtualization security concerns and about Security implementation in networked infra like SAN and NAS,	Case based discussions and demonstration using visuals	
	Lecture 36				Test 3			
Week 13	Lecture 37	Storage Security and Management(Security in virtualized and cloud environment, and concept in practice.)	T-1 R-1	OR-5 RW-2 RW-8	Security aspects in cloud and virtual world, different techniques to be used for them	Students will be able to define and implement the cloud and virtualization security concerns and about Security implementation in networked infra like SAN and NAS,	Case based discussions and demonstration using visuals	
	Lecture 38	Managing the Storage Infrastructure(Monitoring the Storage Infrastructure, Storage infrastructure management in virtualized environment)	T-1 R-2	RW-17	Monitoring of storage infrastructure and its attributes, various domains under it, their configuration	Students will learn about the concepts of data center management protocols and techniques, procedures to be followed	Case based discussions and demonstration using visuals	
	Lecture 39	Managing the Storage Infrastructure(Challenges in managing information, Information lifecycle management, Storage multitenancy, Storage Management Activities)	T-1 R-2	RW-17	Storage multi tenancy in data center scenarios, how it is useful, management activities in data centers	Students will be able to define the multitenancy concept and its usage in cloud and data center	Peer to peer and case based discussion.	
Week 14	Lecture 40	Managing the Storage Infrastructure(Benefits of ILM, storage tiering, and concept in practice, Case Study of EMC Control Center.)	T-1 R-2	OR-5 RW-17	ILM management in business, its role and attributes with respect to applications	Students will define the role played by ILM in information management and procedures used for processing and analysis	Peer to peer and case based	

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			SPILL OVER				
Week 14	Lecture 41				Spill Over		
	Lecture 42				Spill Over		
Week 15	Lecture 43				Spill Over		
	Lecture 44				Spill Over		
	Lecture 45				Spill Over		

Scheme for CA:

CA Category of this Course Code is:A0203 (2 best out of 3)

Component	Weightage (%)	Mapped CO(s)
Test 1	50	
Test 2	50	
Test 3	50	

Details of Academic Task(s)

Academic Task	Objective	Detail of Academic Task	Nature of Academic Task (group/individuals)	Academic Task Mode	Marks	Allottment / submission Week
Test 1	To evaluate the performance of the students on the basis of class test	The syllabus for the class test will be till week 4. The question planned should be combination of both descriptive and analytical	Individual	Offline	30	4 / 5
Test 2	To check the knowledge as well as understanding of the students based upon the concepts taught	The syllabus for the class test will be from week 5 to week 9. The question planned should be combination of both descriptive and analytical	Individual	Offline	30	9 / 10
Test 3	To check the understanding as well as performance of the students based upon the concepts taught	The syllabus for the MCQ based quiz (can be planned as mock for certification exam) or subjective test will be till week 11.	Individual	Offline	30	11 / 12

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