CHT A280: INFORMATION AND STORAGE MANAGEMENT

Item	Value
Curriculum Committee Approval Date	10/20/2021
Top Code	070800 - Computer Infrastructure and Support
Units	3 Total Units
Hours	72 Total Hours (Lecture Hours 45; Lab Hours 27)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S), • Pass/No Pass (B)

Course Description

The course provides a comprehensive introduction to information storage technology which enables students to make more informed decisions in an increasingly complex IT environment. It builds a strong understanding of underlying storage technologies and prepares Student to learn advanced concepts, technologies and products. ADVISORY: CHT A110, IT A110, CIS A110, CHT 191, IT A191 or CIS A191. Transfer Credit: CSU.

Course Level Student Learning Outcome(s)

1. Complete a data flow exercise.
2. Complete a series of case studies including: a. A RAID Case Study b. A SAN Case Study c. A Backup and Recovery Case Study d. A Replication Case Study

Course Objectives

- 1. Describe various storage system architectures.
- 2. Describe the features of different types of storage systems.
- 3. Define the benefits of intelligent storage systems.
- 4. Describe the advantages and disadvantages of different networked storage technologies.
- 5. Define long-term archiving solutions.
- 6. Manage and maintain a Content-Addressable Storage solution in terms of business continuity.
- 7. Manage and maintain an information management infrastructure.
- 8. Manage and maintain an information security environment.
- 9. Describe the emerging field of storage virtualization technologies.

Lecture Content

Section 1 – Introduction to Information Storage Technology Module 1.1 - Meeting Todays Information Storage Needs Describe who is creating data and the amount of data being created Describe the value of data to business List the solutions available for data storage Module 1.2 – Data Center Infrastructure List the core elements of a data center including, applications, databases, servers/operating systems, networks (LAN/SAN), storage arrays. Describe how these core elements are integrated and show an application example. Section 2 - Storage Systems Architecture Module 2.1 – Components of a Host List the hardware and software components of the host environment such as CPU, Memory, bus, I/O devices, Registers, L1/L2 cache, file systems, volume management, Host Bus Adapters. Module 2.2 – Connectivity Describe the physical and logical components of a connectivity environment. Define the key protocols and concepts including; Bus technology, PCI, IDE/ATA, SCSI, and Fibre Channel. Module 2.3 – Physical Disks Describe the major physical components of a disk drive and functionality including platters, spindle, actuator arm, R/W heads, assembly, drive controller. Define the physical structure of disk including sectors, tracks and cylinders. Define the access characteristics for disk drives and performance implications for factors such as rotation, positioning and transfer rates. Define the partitioning of physical drives using zoned bit recording. Module 2.4 – RAID Arrays Define the concept of RAID for data protection. Review and understand the common RAID levels, including RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0 ,RAID 6, Hot Spares, Hot Swap. Module 2.5 – Disk Storage Systems List the benefits and components of an intelligent storage system. Compare and contrast Integrated and Modular storage systems. Explain how a storage system handles I/O flow. Describe the logical elements of an intelligent storage system. Define the Cache Structure and data flow through cache. Section 3 - Networked Storage Module 3.1 – Direct Attached Storage (DAS) Describe the benefits of a DAS based storage strategy and the physical elements in DAS. Define the connectivity options for DAS and distinguish between IDE, ATA and SCSI protocols. Discuss DAS management considerations Module 3.2 - Network Attached Storage (NAS) Define NAS and difference between NAS devices and general purpose file servers. Describe the NAS device components and file services protocols used (NFS and CIFS) connectivity options for NAS. Describe the I/O flow in a NAS environment. List NAS management considerations for performance, storage capacity, back up. Provide NAS examples and solutions to technology problems. Module 3.3 – Fibre Channel Storage Area Networks (FC SAN) Provide an overview of the physical and logical elements of a SAN. Define SAN components including, Host Bus Adapter, Fiber Optic cabling, FC Switch, Disk Array, Management SW. Define Fibre Channel and connectivity layer including FC ports, World Wide Names, FC Addressing, FC log-in process and Fabric topologies. List SAN management considerations such as zoning and LUN masking, security, capacity and performance management. Module 3.4 – Internet Protocol Storage Area Networks (IP SAN) Describe the benefits of IP SAN De scribe IP convergence in the SAN and its implications Describe and discuss the basic architecture of FCIP,iFCP,iSCSI Module 3.5 – Content Addressed Storage (CAS) Describe the benefits of a CAS based storage strategy. Provide an overview of the physical and logical elements of CAS. Describe the storage and retrieval process for CAS data objects Section 4 – Business ContinuityModule 4.1 – Business Continuity Overview List reasons for planned and unplanned outages and describe the impact of downtime. Differentiate between Business Continuity (BC) and Disaster Recovery (DR). Define Information Availability and its importance to the business. Define Recovery Time Objective, Recovery Point Objective Module 4.2 – Back Up and Recovery Define planning requirements for Back Up and Recovery. Define Back Up and Recovery Strategies. Describe the common Backup and Recovery topologies Describe Management considerations for Backup and Recovery Module 4.3 – Business Continuity- Local Replication Discuss replicas and the possible uses of replicas Explain consistency considerations when replicating file systems and databases Discuss Host and Array based Local Replication Technologies Module 4.4 – Business Continuity- Remote Replication Discuss Remote Replication Concepts Synchronous/

Asynchronous Connectivity Options Discuss Host and Array based Remote Replication Technologies Section 5 – Monitoring and Managing the Data Center Module 5.1 – Monitoring the Data Center Define the areas to monitor for an information management infrastructure. Define Health monitoring, Capacity monitoring, Performance monitoring, Security monitoring. Describe the challenges in implementing a unified and centralized monitoring solution in heterogeneous environments Describe Industry standards for data center monitoring Module 5.2 – Managing the Data Center Describe individual task components that need to be performed in the data center in order to achieve overall data center objectives. List the issues for capacity management, availability management, performance management, security management Explain the concept of Information Life Cycle Management. Section 6 – Securing Storage and Storage Virtualization Module 6.1 – Securing the Storage Infrastructure Define storage security. List the critical security attributes for information systems. Describe the elements of a shared storage model and security extensions. Define storage security domains. List and analyze the common threats in each domain. Module 6.2 – Virtualization Technologies Identify different virtualization technologies. Describe block-level and file level virtualization technologies and processes.

Lab Content

Faculty input required.

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

Instructional Techniques

Lecture and application of ideas Students will be presented material from several different sources, including, but not limited to study guides, “Web-based” curriculum, in-class demonstrations of systems integration and personal experiences of industry professionals.Individual and paired exercises During the lab portion of the class, students will be required to perform many of the tasks of a network administrator. In order to complete several projects, students will need to work together in teams to build working local area networks.Interactive computer-based assignments Using computer and “Web-based” training tools, students will be working on simulated networks in order to solve problems.

Reading Assignments

Minimum of 3 hours per week (45 hours) reading from textbook material.

Writing Assignments

Given a minimum set of requirements, the student will design a recommended solution accommodating storage technologies using some combination of NAS, SAN and JBOD. After the solution is designed, the student will create a presentation describing the results. Minimum of 3 hours per week creating and editing class and software projects.

Out-of-class Assignments

45 hours (3hrs/wk). Student performance on quizzes, tests, including short essays, and laboratory assignments will be used to determine proficiency

Demonstration of Critical Thinking

Reading and writing assignments Web-based research Term or other paper(s) Laboratory reports Problem solving demonstrations Exams Homework problems Skill demonstrations Performance exams Case study presentations Objective examinations, including Multiple-choice True/false Completion

Required Writing, Problem Solving, Skills Demonstration

Given a minimum set of requirements, the student will design a recommended solution accommodating storage technologies using some combination of NAS, SAN and JBOD. After the solution is designed, the student will create a presentation describing the results.

Eligible Disciplines

Computer information systems (computer network installation, microcomputer ...: Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience. Computer service technology: Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience.

Textbooks Resources

1. Required EMC Education Services. Information and Storage Management Student Guide, 2 ed. Boston: EMC Corporation, 2013 Rationale: Most current version available.