Level 5 Diploma in PC Engineering & Structured Cabling (108)
133 Credits

Unit: Data Recovery & System Diagnostics	**Guided Learning Hours:** 220
Exam Paper No.: 2	**Number of Credits:** 22
Prerequisites: Knowledge of Windows operating system.	**Corequisites:** A pass or better in Certificate in Networking or equivalence.

Aim: This unit is composed of two combined major topics; data recovery and system diagnostics

Data Recovery

This topic focuses on the firmware components of Hard Disk Drive (HDD); how they operate and interact. Learners need to understand how PCs read and write data and how to diagnose each component to determine the cause of the failure. Learners will work through various common scenarios of HDD failures and recovery procedures and develop a strategy to fix the HDD. Each HDD failure and data rescue is unique but an organised plan ensures that the data is recovered. The unit will show the exact techniques and procedures to follow. The most challenging aspect of data recovery is vendor specific information. As each manufacturer pushes the envelope to design superior HDD with larger and larger capacities, data recovery professionals need tools and knowledge to quickly solve problems they face to make the drive in front of them to work. Techniques and tools that work on one drive will not work on another HDD from a different manufacturer. Sometimes even different models of the same manufacturer have completely different design architectures.

System Diagnostics

This topic specify, for each existing service pack and feature release, the hardware and software requirements necessary to implement and maintain Windows diagnostics in any environment. Whether one is working as a network administrator or have an administrator's level of understanding, this unit covers System Diagnostics in depth to be able to optimise and enhance PCs, servers and data! The System Diagnostics topic is designed to help learners assess, deploy and update servers, workstations and other physical and virtual devices. Once learners master the different features involved, the potential for efficiency, customisation and protection of PCs, servers and data is seemingly limitless. As industry upgrade to new Windows versions every three to five years; this section enable learners easily upgrade to new systems and give the skills for features like interface, security changes required, peripheral components support. In most cases it is only system resources which remain the same, as far as the hardware components are concern; then it varies from computer to computer. Learners gain the essential knowledge in system requirements/resources which includes hard disk storage, RAM, motherboard slots, data bus, address bus and processor frequency etc. The importance of hands-on knowledge and experience in system services and utilities running behind the scenes and how to optimise them can not be over emphasised!

Required Materials: Recommended Learning Resources.	**Supplementary Materials:** Lecture notes and tutor extra reading recommendations.

Special Requirements: The course requires a combination of lectures, demonstrations, discussions, and hands-on labs.

Major Learning Outcomes:	**Assessment Criteria:**
Data Recovery	**Data Recovery**
1 The process of retrieving lost, deleted, unusable or inaccessible data; how it can be restored; data protection technologies, the layout and components of a hard disk.	1.1 Describe data recovery 1.2 Be able to analyse different data recovery symptoms 1.3 Describe data recovery principles 1.4 Describe software data loss causes 1.5 Describe hardware data loss causes 1.6 Define different ways of protecting data 1.7 Describe the technical specifications and parameters of hard disks 1.8 Describe the physical structure of a hard disk

		1.9	Analyse the logical structure of a hard disk
		1.10	Describe hard disk connection synopsis
2 Hard disk data organisation; how data is stored on the hard disk; the drive head can read or write a circular ring, or band (track).		2.1	Describe low level formatting
		2.2	Explain the functions of low-level formatting
		2.3	Describe high level formatting
		2.4	Describe hard disk data storage areas
		2.5	Describe how the Master Boot Record finds the system partition's starting location on the disk, and loads a copy of its Partition Boot Sector into memory
		2.6	Describe Master Boot Record (MBR) recovery process
		2.7	Describe the process of rebuilding the partition table
		2.8	Describe the File Allocation Table (FAT) recovery process
		2.9	Describe the general overview layout of the FAT (File Allocation Table) file system on disk format the FAT16 file system disk
		2.10	Describe FAT16 root directory file management
		2.11	Describe FAT16 sub-directory file management
		2.12	Describe what happens when files are deleted on a FAT16 partition
		2.13	Describe FAT16 formatting process
		2.14	Describe the process of searching files in a FAT16 partition
3 FAT32 file system disk and how FAT32 supports smaller cluster sizes and larger volumes than FAT and the advantages in space allocation.		3.1	Describe FAT32 root directory file management
		3.2	Illustrate how the operating system manages FAT32 sub-directory file management
		3.3	Describe what happens when files are deleted in FAT32 partition
		3.4	Demonstrate how operating system manages sub-directory deletion process
		3.5	Describe FAT32 high level formatting
4 NTFS file system management, demonstrate how NTFS provides performance, security, reliability, and advanced features that are not found in any version of FAT, including how NTFS guarantees volume consistency.		4.1	Analyse NTFS features
		4.2	Describe NTFS file system terminology
		4.3	Describe NTFS data construction
		4.4	Define NTFS drivers
		4.5	Describe DOS Boot Record (DBR) NTFS file system
		4.6	Describe NTFS file system meta data
		4.7	Describe NTFS file and folder attributes
		4.8	Describe NTFS index record
5 Redundant Array of Inexpensive Disks (RAID) specifications detailing levels 0, 1, 2, 3, 4 and 5, the implementation and inherent strengths and weaknesses.		5.1	Explain RAID background
		5.2	Describe RAID implementation process
		5.3	Demonstrate how to transform a basic disk into a dynamic disk
		5.4	Describe dynamic disk terms
		5.5	Describe dynamic disk characteristics

6	Data recovery software; file recovery; recovering deleted files, hard drive data recovery, raid data recovery, NAS recovery, bootable; consistency checkers, forensics and imaging tools	6.1	Demonstrate how to install data recovery software
		6.2	Demonstrate how to recover lost data
		6.3	Examine the different hard drive data recovery software
System Diagnostics		**System Diagnostics**	
7	Understand Windows startup programs, why it takes long for the system to boot-up and system startup files; components, features and various physical components that make up the BIOS of a typical machine.	7.1	Explain Windows diagnostics utilities
		7.2	Be able to use the Windows registry editor
		7.3	Describe Windows filename restrictions and limitations
		7.4	Describe file extensions and associations
		7.5	Differentiate the file system files
		7.6	Analyse Windows disk management process
		7.7	Configure Windows dual-boot system
		7.8	Examine the boot-ini file components
		7.9	Analyse Windows Backup utilities
		7.10	Describe the Windows startup modes
		7.11	Describe Windows system restore and recovery
		7.12	Demonstrate upgrading different Windows system process
8	How a PC system utilities application clean the computer's registry, repair its hard drive, generate free space on its hard drive, optimise system processes and recover data.	8.1	Demonstrate how to use the Microsoft Management Console (MMC)
		8.2	Analyse the different fonts
		8.3	Demonstrate how to remap the keyboard layout
		8.4	Describe the impact of restricted accounts on programs
		8.5	Identify and review TCP/IP network tools
		8.6	Analyse the different system folders
		8.7	Describe Dynamic-link library (DLL) files and their functions
		8.8	Demonstrate how to configure control panel and shortcut icons
		8.9	Describe Windows environment variables
		8.10	Examine and be able to describe the task manager properties
		8.11	Describe how to use Windows Task Manager to start programs, to end processes, and to monitor the computer's performance
9	The process of changing BIOS and Windows settings using the System Configuration Utility to speed up the boot-up process.	9.1	Demonstrate how to customise taskbar, start menu and shortcuts
		9.2	Describe how to configure Windows Explorer
		9.3	Demonstrate how to organise the favourites folder and personal files
		9.4	Demonstrate creating and using script files
10	Understand the aims of performance evaluation; step-by-step approach to developing; implementing a fair and consistent system	10.1	Analyse system performance requirements

performance evaluation.	10.2	Describe system performance factors
	10.3	Descrobe processor performance enhancement techniques
	10.4	Design and create live system configuration (data backup, viruses etc)
	10.5	Describe the purpose and functions of Windows upgrades
	10.6	Outline steps on how to perform updates on a Microsoft Windows computer
	10.7	Demonstrate how to scan for updates
	10.8	Describe how to update a Microsoft Windows computer

Methods of Evaluation: A 2½-hour written examination paper with five essay questions, each carrying 20 marks. Candidates are required to answer all questions. Candidates also undertake project/coursework in Data Recovery & System Diagnostics with a weighting of 100%.

Recommended Learning Resources: Data Recovery & System Diagnostics

Text Books	**Data Recovery** • Data Recovery Tips & Solutions: Windows, Linux, and BSD by Kris Kaspersky. ISBN-10: 1931769567 • Guide to Data Recovery by Paul Mace. ISBN-10: 0136544274 • Que's Guide to Data Recovery by Scott Mueller. ISBN-10: 0880225416 **System Diagnostics** • System Center Configuration Manager (SCCM) by Kerrie Meyler, Byron Holt, Greg Ramsey & Anthony Puca. ISBN-10: 0672330237 • System Center Configuration Manager by Brad Price & Daniel Eddy. ISBN-10: 1435456505 • Mastering System Center Configuration Manager 2007 by Chris Mosby, Ron D. Crumbaker & Christopher W. Urban. ISBN-10: 047017367X
Study Manuals	BCE produced study packs
CD ROM	Power-point slides
Software	Windows Operating Systems and Data Recovery Software