LONDON CAPITAL COMPUTER COLLEGE

Diploma in Unix (189) – Unix Performance Management

Prerequisites: Knowledge in Unix operating system.	**Corequisites:** A pass or higher in Certificate in Unix Networking or equivalence.

Aim: As the first course in the Diploma in Unix Networking, this course familiarizes students with the different Unix environments and covers the basics of System Administration and user management. This is an intermediate course on the internal operations and fundamental principles of modern operating systems. Specifically, this course will cover core concepts such as processes and threads, deadlocks, memory management, and file systems. The course will concentrate on "Background information" - what happens behind the scenes on a Unix system. It covers what the filesystem is, how it's structured, and various concepts involved, such as symbolic links; the concrete stuff - mounting volumes and files. One of the brilliant design moves of the UNIX operating system is that everything that can be represented as a file, is represented as a file. A hard disk is a file, a terminal is a file, your webcam is a file - everything. Other topics include: Basic concepts, system calls, relative paths, permissions, symbolic links, commonly used devices, anatomy of a filesystem, virtual filesystems; Processes and Threads: interprocess communication, scheduling; Deadlocks: detection, recovery, avoidance, prevention; Memory Management: swapping, virtual memory, replacement algorithms, segmentation; Input/Output: disks, clocks, character-oriented terminals, graphical user interfaces, power management; File Systems: directories, file system implementation, examples; Security: cryptography basics, authentication, attacks, protection mechanisms, trusted systems; Case Study: Unix, Linux and Windows: overview, processes, memory management, I/O, file system, security

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:**
1. Describe why monitoring system resources is of major concern to the system administrator in analysing resource utilisation and constraints.	1.1 Analyse functionality and performance metrics 1.2 Identify system resources and their metrics 1.3 Identify system design techniques 1.4 Describe multiplexing 1.5 Distinguish pipelining and parallelism
2. Describe the process of system performance analysis in measuring, evaluating, and understanding system performance.	2.1 Outline performance analysis steps 2.2 Describe the process of interpreting and present results
3. Describe kernel parameters and demonstrate how to configure UNIX Kernel Parameters.	3.1 Describe kernel configuration and organisation 3.2 Outline the context of a process 3.3 Describe signalling 3.4 Explore Unix system entry configurations 3.5 Outline the run-time organisation 3.6 Describe shared data security in network system 3.7 Identify Unix kernel properties
4. Describe process-scheduling algorithms and how the process scheduler keeps the CPU busy by allocating it to the highest priority process.	4.1 Analyse process priority scheduling 4.2 Explore how the system calculates priority 4.3 Describe priority problems 4.4 Define priority inversion
5. Describe the functions, tasks of the threads and how the system supports a single or multi-user process.	5.1 Define a thread

	5.2 Describe advantages of threads 5.3 Outline thread implementation 5.4 Describe multiprocess synchronisation issues 5.5 Define recursive lock
6. Describe the function for the I/O system and how it hides the details in the different hardware units from the main part of the kernel.	6.1 Analyse the importance of I/O system 6.2 Explore unix device types 6.3 Describe functions and components of device driver 6.4 Analyse the device/driver association
7. Demonstrate how unix sockets use inter-process-communication mechanism to allow bidirectional data exchange between processes.	7.1 Define a socket 7.2 Outline the TCP socket data and control flows
8. Describe how Remote Procedure Call (RPC) techniques are used for constructing distributed, client-server.	8.1 Describe the client/server model mechanism 8.2 Describe procedure call parameter passing 8.3 Describe RPC problems 8.4 Define dynamic binding 8.5 Describe RPC semantics and failures 8.6 Identify RPC implementation issues
9. Outline benchmarking as a technique for solving system communication, unix system monitoring tools and performance monitor.	9.1 Describe the purpose of performance benchmarking 9.2 Outline performance benchmarking approaches
10. Describe the Unix file system (UFS) and how Unix divides physical disks into logical disks.	10.1 Describe file system interface 10.2 Describe file system consistency approaches 10.3 Describe memory based file system 10.4 Describe log-structure file system
11. Describe Distributed File Systems (DFSs) and the need to share network resources.	11.1 Define remote file system and Andrew file system 11.2 Describe the goals of NFS 11.3 Outline the operations and structure of NFS 11.4 Describe NFS protocol 11.5 Analyse NFS implementation techniques 11.6 Describe NFS security issues
12. Describe Unix virtual memory system and the memory management unit and demonstrate paging is one of the memory-management schemes.	12.1 Analyse the purpose of virtual management 12.2 Explore the memory-mapped file approach 12.3 Describe the relationship between file and virtual memory subsystems
13. Describe how Distributed Computing Environment (DCE) tools are used for developing and deploying multi-platform, secure, enterprise-wide distributed systems.	13.1 Outline the different forms of shared memory 13.2 Describe clock synchronisation 13.3 Define atomic transaction

Recommended Learning Resources:
Unix Performance Management

Text Books	• System Files and Devices Reference Manual by Motorola/UNIX System Labs ISBN-10: 0130358746 • Unix File System ISBN-10: 6133569204 • BSD, Including: SunOS, 386bsd, NeXTSTEP, Darwin (Operating System), OpenStep, Ultrix, Unix File System, Coherent (Operating System), V by Hephaestus Books ISBN-10: 1242974385
Study Manuals 	BCE produced study packs
CD ROM 	Power-point slides
Software 	Unix Operating System