NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF SCIENCES
COMPUTER SCIENCE PROGRAM

CC222 – OPERATING SYSTEMS

I. GENERAL INFORMATION

CODE	: CC222 Operating Systems
SEMESTER	: 4
CREDITS	: 4
HOURS PER WEEK	: 6 (Theory – Laboratory)
PREREQUISITES	: CC221 Computer architecture
CONDITION	: Mandatory

II. COURSE DESCRIPTION

Know the basic elements of the design of the operating systems. Presents the administration of the Linux system as a first step to work in open software. It presents some of the open software tools so that it is eventually part of an open software project.

III. LEARNING UNITS

1. Distributed Algorithms

I: Consensus and choice.
II: Termination detection.

2. Overview of Operating Systems

I: Role and purpose of the operating systems.
II: History of the development of the operating systems.
III: Functionality of a typical operating system.
IV: Support mechanisms for client-server models, hand-held devices.
V: Topics of Design (efficiency, robustness, flexibility, portability, security, compatibility).
VI: Influences of security, networks, multimedia and windows.

3. Principles of Operating Systems

I: Structured methods (monolithic, layered, modular, microkernel models).
II: Abstractions, processes and resources.
III: API concepts.
IV: Need for applications and evolution of hardware and software techniques.
V: Organization of devices.
VI: Interruptions: Methods and implementations.

VII: Concept of user/system status and protection, transition to Kernel mode.

4. Concurrence

I: States and state diagrams.
II: Structures (list, process control blocks, or etc.).
III: Dispatches and commutation according to context.
IV: The role of interruptions.
V: Concurrent execution: advantages and disadvantages.
VI: The problem of mutual exclusion and some solutions.
VII: Deadlock: causes, conditions and prevention.
VIII: Models and mechanisms (traffic lights, monitors, condition and rendezvous variables).
IX: Consumer or producer problems and synchronization.
X: Multiprocessing problems (Spin-Locks, re-entry).

5. Schedule and Dispatch

I: Preventive and non-preventive planning.
II: Planning and policies.
III: Processes and threads.
IV: Deadlines and real-time problems.

6. Memory Management

I: Review of the physical memory and the management of the hardware memory.
II: Reo delays, exchanges and partitions.
III: Pagination and segmentation.
IV: Assignment and replacement policies.
V: Work sets and trashing.
VI: Caching.

7. Device Management

I: Characteristics of serial and parallel devices.
II: Strategies of buffering.
III: Direct access to memory.

8. Security and Protection

I: Panoramic view of system security.
II: Policy and separation mechanisms.
III: Security methods and devices.
IV: Protection, access and authentication.
V: Protection models.
VI: Memory protection.
VII: Encryption.
VIII: Recovery Administration.

9. File System

I: Files: data, meta-data, operations, organization, buffering, sequential, non-sequential.
II: Directories: content and structure.

III: File systems: partitioning, assembly / disassembly, virtual file systems.
IV: Techniques of standard implementation.
V: Files mapped in memory.
VI: Special purpose file systems.
VII: Named, search, access, backup copies.

10. Dedicated and Real Time Systems

I: Planning of tasks and processes.
II: Memory / disk management requirements in a real-time environment.
III: Failures, risks, and recovery.
IV: Special concerns in real-time systems.

11. Scripting

I: Scripting and the role of the scripts languages.
II: Basic commands of the system.
III: Script creation, step of parameters.
IV: Execution of a script.
V: Influences of the scripting in the programming.

12. Linux / UNIX system administration

I: Introduction.
II: Command line in UNIX.
III: Processing of text streams using filters.
IV: File system.
V: Use of UNIX streams, pipes, and re-directions.
VI: Text file search using expressions regular.
VII: Job control.
VIII: Process creation, process monitoring, and process elimination.
IX: Modification of process execution priorities.
X: Use of shells.
XI: Concepts of the file system.
XII: Creation and change of symbolic links.
XIII: Files belonging permissions.
XIV: Uses of permissions to control the access to the files.

13. Tools for Linux / UNIX system administration

I: Creation of partitions and file systems.
II: Management and control to mount and dismount a file system.
III: File integrity maintenance.
IV: File system search and file systems movement.
V: Monitor the use of the disks.
VI: Start the system.
VII: Change of execution levels, system shutdown, re-initiation of the system.
VIII: Use and management of system documentation.
IX: Search of Linux documentation in the system as in the Internet.
X: Modification of the environment and management of system environment variables.
XI: Configuration and use of system log files.
X: Automation and dispatcher of administrative tasks.
XI: Backup. Tools in open software.

IV. BIBLIOGRAPHY

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