



**NATIONAL UNIVERSITY OF ENGINEERING**  
**COLLEGE OF INDUSTRIAL AND SYSTEMS ENGINEERING**  
**SYSTEMS ENGINEERING PROGRAM**

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**SYLLABUS - ST324 OPERATING SYSTEMS**

**I. GENERAL INFORMATION**

<b>CODE</b>	: ST324
<b>SEMESTER</b>	: 7
<b>CREDITS</b>	: 3
<b>HOURS PER WEEK</b>	: 4 (Theory –Practice)
<b>PREREQUISITES</b>	: TP123 Digital Systems
<b>CONDITION</b>	: Compulsory
<b>INSTRUCTOR</b>	: Carlos Janjachi, Carlos Calero

**II. COURSE DESCRIPTION**

This course is made up of six subject units: Introduction and basic concepts, processor management, real memory management, virtual memory, device and file management.

**III. COURSE OUTCOMES**

1. Understand general concepts of Operating Systems.
2. Understand the operating systems operation and its relationship with the equipment hardware and application systems.
3. Identify structural modules of an operating system.
4. Identify and assess differences in operating systems.
5. Install, configure, manage and use in advance mode the operating system of a computer.
6. Identify and study the design of an operating system from the local market so that students are able to identify its internal components and explain how they work.

**IV. LEARNING UNITS**

**1. INTRODUCTION AND BASIC CONCEPTS / 8 HOURS**

Architecture and generation of computers / Functions and characteristics of operating systems / History and types of operating systems / Structure and design of operating systems.

**2. PROCESSOR MANAGEMENT / 16 HOURS**

Definition and type of processes / States of a process / Interruptions / Threads / Synchronization of processes, semaphores / Deadlock and its policies / CPU planning, objectives and algorithms / CPU planning in UNIX.

**3. REAL MEMORY MANAGEMENT / 4 HOURS**

Memory hierarchy / real memory organization and assignment / Strategies of memory acquirement, placement and replacement / management techniques with fixed and variable partitions.

#### **4. VIRTUAL MEMORY MANAGEMENT / 20 HOURS**

Virtual memory precedents / Types / Paged virtual memory, organization, management strategies / Segmented and paged / Study case. Linux replacement algorithm.

#### **5. INPUT/OUTPUT DEVICES MANAGEMENT / 4 HOURS**

Input/output devices manager functions / Driver functions / Hard disk planning / Writing policies of the hard disk. Other input/output devices.

#### **6. FILES MANAGEMENT / 4 HOURS**

Definition of file and directory / Files manager functions (file system) / Main operations for managing a file / Types of space assignment for files, contiguous and non-contiguous / Study case. UNIX file system.

#### **V. WORKSHOP SESSIONS:**

Processes: Management simulation of several processes through the execution of C language routines.

Memory: Management simulation and operation of memory through the execution of C language routines.

Input/output devices: Simulation of interactions among the CPU and input/output devices.

File System: management and operation of file system from free and proprietary operating systems through assisted guides.

Management of server operating systems: Management and operation of server services.

#### **VI. METHODOLOGY**

The course is carried out through theory, practical and lab sessions. In theory sessions, the instructor introduces concepts, policies and mechanisms of an operating system for the management of the computing resources. In lab sessions, Linux operating systems and C programming language will be used for the construction of programs which allow students to verify and understand the operation and design of this operating system. Furthermore, practical guides will be provided to students so that they students can interact with the operating system in its operation, management and support. In all sessions, students' active research and participation are encouraged.

#### **VII. EVALUATION FORMULA**

The average grade PF is calculated as follows:

$$PF = 0.25*EP + 0.30*EF + 0.15*((P1 + P2)/2) + 0.30*((L1 + L2 + L3 + L4)/4)$$

EP: Mid-Term Exam

EF: Final Exam

L#: Labs

P#: Quizzes

#### **VIII. BIBLIOGRAPHY**

1. **TANENBAUM, ANDREW**  
Modern Operating Systems (Spanish)  
Prentice Hall Editorial, 3<sup>rd</sup> Edition, 2005
2. **TANENBAUM, ANDREW**  
Operating Systems Design and Implementation  
Prentice Hall Editorial, 3<sup>rd</sup> Edition, 2006
3. **SILBERSCHATZ, AVI**  
Operating System Concepts  
John Wiley & Sons Inc., 7<sup>th</sup> Edition, 2004