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Course Title: Operating System – Managing Computer Resources

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"Code. Notes. Clarity."

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Introduction

Operating System (OS) acts as an interface between user and hardware, managing resources and tasks.

Functions of OS

- Process management
 - Memory management
 - File system control
 - Device management
 - Security & Protection
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System Components

- Kernel
 - Shell
 - System libraries
 - System utilities
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Types of OS

- Batch
 - Time-sharing
 - Distributed
 - Embedded
 - Real-time
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Process Management

- Process lifecycle: New, Ready, Running, Waiting, Terminated
 - Process Control Block (PCB)
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Threads & Concurrency

- Threads: lightweight processes
 - Multithreading
 - Context switching
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CPU Scheduling

- FCFS, SJF, Round Robin, Priority
 - Scheduling criteria: CPU utilization, throughput, turnaround time
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Process Synchronization

- Critical section problem
 - Solutions: Peterson's algorithm, Semaphores, Mutex
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Deadlocks

- Four conditions: Mutual exclusion, Hold and wait, No preemption, Circular wait
 - Prevention, Avoidance (Banker's Algorithm), Recovery
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Memory Management

- Contiguous allocation
 - Paging
 - Segmentation
 - Fragmentation: internal vs external
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Virtual Memory

- Demand paging
 - Page replacement: FIFO, LRU
 - Thrashing
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File System

- Directory structure
 - File access methods: sequential, indexed
 - File allocation: contiguous, linked, indexed
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I/O Systems

- I/O Hardware
 - Polling, Interrupts
 - Direct Memory Access (DMA)
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Security & Protection

- User authentication
 - Access control lists
 - Encryption basics
 - Malware types
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Summary

Operating System is critical to system performance, reliability, and user experience. It manages all core system operations.

Next: Explore how data travels across networks in the Networking Module.