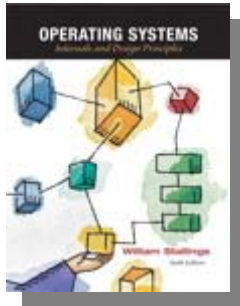# Exit Exam Preparation Guide for Operating Systems
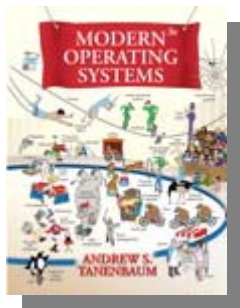
Required Textbook:

- William Stallings, Operating Systems, Internals and Design Principles, Sixth Edition (**ISBN-10**: 0-13-600632-9, **ISBN-13**: 9780-13-600632-9)

Recommended Textbook:

- Andrew S. Tanenbaum, Modern Operating Systems, Third Edition (**ISBN-10**: 0-13-600663-9, **ISBN-13**: 9780-13-600663-3)

Major topics covered by the exit exam (the following list is a guideline and some other details are included in the exam):

1. Operating system overviews

(1) Objectives in operating systems
(2) Evolution of operating systems
   - No-operating system, batch system, multi-programmed batch system, multi-programmed operating system, time sharing operating system, etc.
(3) Major functions in operating systems
(4) Middleware
(5) Concept of virtual machine
(6) Monolithic and modularized operating system design
(7) Mode of execution: kernel-mod and user-mode

(this list continues to the next page)

2. Processes and Thread

(1) Concept of processes
(2) Context switching and interrupt
(3) Process states
    - Two-state model
    - Five-state model
(4) Process description
(5) Process control
(6) Different levels of Scheduling
    - Long-term scheduling
    - Medium-term scheduling
    - Short-term scheduling
(7) Concept of threads
    - User-mode and kernel-mode threads
    - Micro-kernel architecture
    - Thread states
(8) Scheduling algorithms and different types of processes
    - I/O-bound and process-bound processes
    - Various process scheduling algorithms and their properties (such as advantages/disadvantages, preemptive/non-preemptive scheduling, etc.)
(9) Real-time process scheduling and scheduling algorithms

3. Concurrency control (mutual exclusion & synchronization)

(1) Principles of concurrency
    - Race condition & atomicity
    - Mutual exclusion
    - Semaphores
    - Message passing
(2) Principles of deadlock
(3) Deadlock prevention
(4) Deadlock avoidance

4. Process migration and distributed operating systems

(1) Concept of process migration
(2) Different migration granularity
(3) Different types of distributed systems
(4) Concept of logical clock
(5) Distributed mutual exclusion
(6) Distributed deadlock detection
(7) ORB (Object request Broker)

5. File system

    (1) Concept of file
        - User files, special files
        - Ordinary files and directories
    (2) Different type of file system (MS FAT and UNIX i-node)
    (3) Implementation of file system
        - File space allocation & management
        - Compaction & internal and external fragmentation
        - Disk space utilization
        - Access latency
    (4) Concept of paging
    (5) File system boot sequence
        - Boot sector, IPL, MBR, partition table and root directory

6. Memory management

    (1) Internal and external fragmentation
        - Memory space allocation and relocation
        - Memory partitioning
    (2) Concept of paging
    (3) Virtual memory and segmentation
        - Physical and logical address space
        - Protection error
        - Page replacement algorithms

7. I/O devices

    (1) Programmed I/O, interrupts, DMA
    (2) RAID
        - RAID level 0 through 4
        - Hamming code
    (3) Operating system design issues related to I/O subsystems

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End of the list (last updated: 11:56PM, August 23, 2009)