Textbook chapters are listed with the associated topics.

Also, consider the associated Links and References (Canvas, On-Line) provided in the class schedule.

Main topics:

- **Ch 1: Introduction to OS**
  - What is an Operating System? What are the OS goals?
  - Computer System Components (Users, Application Programs, OS, Hardware)
  - OS Usages
  - The Evolution of Operating Systems
    - Serial Processing: No Operating Systems
    - Simple Batch Systems: Monitor
    - Multiprogram Batch Systems
    - Time-Sharing Systems
  - Computer-System Architecture and the Advantageous
    - Asymmetric Multiprocessing
    - Symmetric Multiprocessing
  - Advanced OS
    - Distributed OS
    - Network OS
    - Real-time OS (Hard and Soft Deadlines)
  - Computer-System Operation
    - Dual-mode operation
  - Interrupts (what is it? what types?, Handling)
  - Storage Hierarchy
    - Speed, Cost, Volatility
    - Caching
  - Operating System Components
    - Process Management
    - Memory Management
    - Storage Management
    - File-System Management
      - Mass-Storage Management
      - Caching
      - I/O Systems
    - Protection and Security
  - Virtual Machines (what? idea and benefit)

- **Ch 2: Operating System Services and Structures**
  - Operating System Services
    - User interface
    - Program execution
    - I/O operations
    - File-system manipulation

- Communications
- Error detection
- Resource allocation
- Accounting
- Protection and security
  - System Calls (API, Types)
  - Operating System Structure
    - Simple structure (monolithic) – MS-DOS
    - Layered – an abstraction
    - Microkernel – Mach
    - Modules – Solaris
    - Hybrid

- **Ch 3: Processes**
  - What is a process?
  - Process Parts
    - Program code (Text Section)
    - Current Activity (Registers)
    - Data (Stack, Data Section, and Heap)
  - Process vs. Program
  - Process Management Tasks
  - Process States
  - Process Control Block
  - Context Switch
  - Process Scheduling
    - Main goals
    - Process Scheduling Queues
  - Types of Scheduler (long-term, medium-term, and short-term)
  - Process Creation and Termination (fork() and exit())
  - Interprocess Communication (IPC)
    - Shared memory
    - Message passing
  - Types of Communication
    - Indirect
    - Direct
  - Message passing Types
    - Blocking (Synchronous)
    - Non-blocking (Asynchronous)

- **Ch 4: Threads**
  - Process Characteristics
    - Resource Ownership, Scheduling/Execution
  - What is a thread?

- o Single and Multithreaded Processes
- o Key Benefits of Threads in comparison with Process
- o Benefits of Threads
    - Responsiveness
    - Resource Sharing
    - Economy
    - Scalability
- o Single-threaded vs. Multi-threaded Approaches
- o Concurrency vs. Parallelism
    - Types of parallelism
- o Thread Types(models) and their advantages and disadvantages
    - User Level Thread (ULT)
    - Kernel Level Thread (KLT) - Kernel-supported thread or Lightweight Process
    - Combined
- o Or (Silberschatz)
    - Many-to-One
    - One-to-One
    - Many-to-Many

- **Ch 5: CPU Scheduling**

    - o What is scheduling? What are the (resource) scheduling objectives?
    - o Types of Scheduling?
        - Long-term, medium-term, and short-term (CPU) scheduling
    - o Scheduling and Process State Transitions
    - o Queuing Diagram for Scheduling
    - o CPU burst and IO burst
    - o Preemptive vs. Non-preemptive Scheduling
    - o Scheduling Criteria
        - User-oriented
            - Turnaround time, Response time, Waiting time
        - System-oriented
            - CPU utilization, Throughput
    - o CPU Scheduling Algorithms
        - First Come First Served (FCFS)
        - Shortest Job First (SJF)
        - Shortest Remaining Time First (SRTF)
        - Highest Response Ratio Next (HRRN)
        - Round Robin (RR)
        - Virtual Round Robin (VRR)
        - Multilevel Feedback Queue (MLFQ)
        - Priority Scheduling (PR)
        - Multilevel Queue

- Scheduling Algorithm Evaluation Approaches
  - Deterministic Modeling
  - Queueing Models
  - Simulations
  - Implementation