uCertify

Course Outline

Operating System Concepts

19 May 2024

1. Course Objective
2. Pre-Assessment
3. Exercises, Quizzes, Flashcards & Glossary

   Number of Questions
4. Expert Instructor-Led Training
5. ADA Compliant & JAWS Compatible Platform
6. State of the Art Educator Tools
7. Award Winning Learning Platform (LMS)
8. Chapter & Lessons

   Syllabus

   Chapter 1: Introduction

   Chapter 2: Operating-System Structures

   Chapter 3: Processes

   Chapter 4: Threads & Concurrency

   Chapter 5: CPU Scheduling

   Chapter 6: Synchronization Tools

   Chapter 7: Synchronization Examples

   Chapter 8: Deadlocks

   Chapter 9: Main Memory

   Chapter 10: Virtual Memory

   Chapter 11: Mass-Storage Structure

   Chapter 12: I/O Systems

   Chapter 13: File-System Interface

   Chapter 14: File-System Implementation

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Chapter 19: Networks and Distributed Systems

Videos and How To

9. Practice Test

   Here's what you get

   Features

10. Performance Based labs

    Lab Tasks

    Here's what you get

11. Post-Assessment

1. Course Objective

Use the Operating System Concepts course and lab to understand the operating system software. The course and lab cover several topics such as data structures used in operating systems, computing environments, open-source and free operating systems, file system implementation, and many more. The course comes with labs that provide a virtual environment for users to explore and learn. The Operating system course describes the general organization of a computer system and the role of interrupts.

2. Pre-Assessment

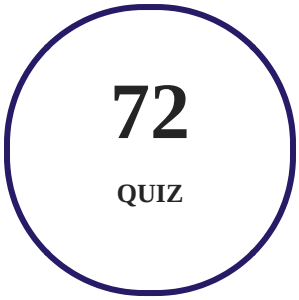
Pre-Assessment lets you identify the areas for improvement before you start your prep. It determines what students know about a topic before it is taught and identifies areas for improvement with question assessment before beginning the course.

3. Exercises

There is no limit to the number of times learners can attempt these. Exercises come with detailed remediation, which ensures that learners are confident on the topic before proceeding.

4. Quiz

Quizzes test your knowledge on the topics of the exam when you go through the course material. There is no limit to the number of times you can attempt it.



5. flashcards

Flashcards are effective memory-aiding tools that help you learn complex topics easily. The flashcard will help you in memorizing definitions, terminologies, key concepts, and more. There is no limit to the number of times learners can attempt these. Flashcards help master the key concepts.

6. Glossary of terms

uCertify provides detailed explanations of concepts relevant to the course through Glossary. It contains a list of frequently used terminologies along with its detailed explanation. Glossary defines the key terms.

7. Expert Instructor-Led Training

uCertify uses the content from the finest publishers and only the IT industry's finest instructors. They have a minimum of 15 years real-world experience and are subject matter experts in their fields. Unlike a live class, you can study at your own pace. This creates a personal learning experience and gives you all the benefit of hands-on training with the flexibility of doing it around your schedule 24/7.

8. ADA Compliant & JAWS Compatible Platform

uCertify course and labs are ADA (Americans with Disability Act) compliant. It is now more accessible to students with features such as:

- Change the font, size, and color of the content of the course
- Text-to-speech, reads the text into spoken words
- Interactive videos, how-tos videos come with transcripts and voice-over
- Interactive transcripts, each word is clickable. Students can clip a specific part of the video by clicking on a word or a portion of the text.

JAWS (Job Access with Speech) is a computer screen reader program for Microsoft Windows that reads the screen either with a text-to-speech output or by a Refreshable Braille display. Student can easily navigate uCertify course using JAWS shortcut keys.

9. State of the Art Educator Tools

uCertify knows the importance of instructors and provide tools to help them do their job effectively. Instructors are able to clone and customize course. Do ability grouping. Create sections. Design grade scale and grade formula. Create and schedule assessments. Educators can also move a student from self-paced to mentor-guided to instructor-led mode in three clicks.

10. Award Winning Learning Platform (LMS)

uCertify has developed an award winning, highly interactive yet simple to use platform. The SIIA CODiE Awards is the only peer-reviewed program to showcase business and education technology's finest products and services. Since 1986, thousands of products, services and solutions have been

recognized for achieving excellence. uCertify has won CODiE awards consecutively for last 7 years:

- **2014**
    1. Best Postsecondary Learning Solution

- **2015**
    1. Best Education Solution
    2. Best Virtual Learning Solution
    3. Best Student Assessment Solution
    4. Best Postsecondary Learning Solution
    5. Best Career and Workforce Readiness Solution
    6. Best Instructional Solution in Other Curriculum Areas
    7. Best Corporate Learning/Workforce Development Solution

- **2016**
    1. Best Virtual Learning Solution
    2. Best Education Cloud-based Solution
    3. Best College and Career Readiness Solution
    4. Best Corporate / Workforce Learning Solution
    5. Best Postsecondary Learning Content Solution
    6. Best Postsecondary LMS or Learning Platform
    7. Best Learning Relationship Management Solution

- **2017**
    1. Best Overall Education Solution
    2. Best Student Assessment Solution
    3. Best Corporate/Workforce Learning Solution
    4. Best Higher Education LMS or Learning Platform

- **2018**
    1. Best Higher Education LMS or Learning Platform

2. Best Instructional Solution in Other Curriculum Areas
3. Best Learning Relationship Management Solution

- **2019**
  1. Best Virtual Learning Solution
  2. Best Content Authoring Development or Curation Solution
  3. Best Higher Education Learning Management Solution (LMS)

- **2020**
  1. Best College and Career Readiness Solution
  2. Best Cross-Curricular Solution
  3. Best Virtual Learning Solution

11. Chapter & Lessons

uCertify brings these textbooks to life. It is full of interactive activities that keeps the learner engaged. uCertify brings all available learning resources for a topic in one place so that the learner can efficiently learn without going to multiple places. Challenge questions are also embedded in the chapters so learners can attempt those while they are learning about that particular topic. This helps them grasp the concepts better because they can go over it again right away which improves learning.

Learners can do Flashcards, Exercises, Quizzes and Labs related to each chapter. At the end of every lesson, uCertify courses guide the learners on the path they should follow.

Syllabus

Chapter 1: Introduction

- What Operating Systems Do
- Computer-System Organization
- Computer-System Architecture

- Operating-System Operations
- Resource Management
- Security and Protection
- Virtualization
- Distributed Systems
- Kernel Data Structures
- Computing Environments
- Free and Open-Source Operating Systems
- Summary
- Practice Exercises
- Exercises
- Further Reading
- Bibliography

Chapter 2: Operating-System Structures

- Operating-System Services
- User and Operating-System Interface
- System Calls

- System Services
- Linkers and Loaders
- Why Applications Are Operating-System Specific
- Operating-System Design and Implementation
- Operating-System Structure
- Building and Booting an Operating System
- Operating-System Debugging
- Summary
- Practice Exercises
- Exercises
- Further Reading
- Bibliography

Chapter 3: Processes

- Process Concept
- Process Scheduling
- Operations on Processes
- Interprocess Communication

- IPC in Shared-Memory Systems
- IPC in Message-Passing Systems
- Examples of IPC Systems
- Communication in Client–Server Systems
- Summary
- Practice Exercises
- Exercises
- Further Reading
- Bibliography

Chapter 4: Threads & Concurrency

- Overview
- Multicore Programming
- Multithreading Models
- Thread Libraries
- Implicit Threading
- Threading Issues
- Operating-System Examples

- Summary
- Practice Exercises
- Exercises
- Further Reading
- Bibliography

Chapter 5: CPU Scheduling

- Basic Concepts
- Scheduling Criteria
- Scheduling Algorithms
- Thread Scheduling
- Multi-Processor Scheduling
- Real-Time CPU Scheduling
- Operating-System Examples
- Algorithm Evaluation
- Summary
- Practice Exercises
- Exercises

- Further Reading
- Bibliography

Chapter 6: Synchronization Tools

- Background
- The Critical-Section Problem
- Peterson's Solution
- Hardware Support for Synchronization
- Mutex Locks
- Semaphores
- Monitors
- Liveness
- Evaluation
- Summary
- Practice Exercises
- Exercises
- Further Reading
- Bibliography

Chapter 7: Synchronization Examples

- Classic Problems of Synchronization
- Synchronization within the Kernel
- POSIX Synchronization
- Synchronization in Java
- Alternative Approaches
- Summary
- Practice Exercises
- Exercises
- Further Reading
- Bibliography

Chapter 8: Deadlocks

- System Model
- Deadlock in Multithreaded Applications
- Deadlock Characterization
- Methods for Handling Deadlocks

- Deadlock Prevention
- Deadlock Avoidance
- Deadlock Detection
- Recovery from Deadlock
- Summary
- Practice Exercises
- Exercises
- Further Reading
- Bibliography

Chapter 9: Main Memory

- Background
- Contiguous Memory Allocation
- Paging
- Structure of the Page Table
- Swapping
- Example: Intel 32- and 64-bit Architectures
- Example: ARMv8 Architecture

- Summary
- Practice Exercises
- Exercises
- Further Reading
- Bibliography

Chapter 10: Virtual Memory

- Background
- Demand Paging
- Copy-on-Write
- Page Replacement
- Allocation of Frames
- Thrashing
- Memory Compression
- Allocating Kernel Memory
- Other Considerations
- Operating-System Examples
- Summary

- Practice Exercises
- Exercises
- Further Reading
- Bibliography

Chapter 11: Mass-Storage Structure

- Overview of Mass-Storage Structure
- HDD Scheduling
- NVM Scheduling
- Error Detection and Correction
- Storage Device Management
- Swap-Space Management
- Storage Attachment
- RAID Structure
- Summary
- Practice Exercises
- Exercises
- Further Reading

- Bibliography

Chapter 12: I/O Systems

- Overview
- I/O Hardware
- Application I/O Interface
- Kernel I/O Subsystem
- Transforming I/O Requests to Hardware Operations
- STREAMS
- Performance
- Summary
- Practice Exercises
- Exercises
- Further Reading
- Bibliography

Chapter 13: File-System Interface

- File Concept
- Access Methods

- Directory Structure
- Protection
- Memory-Mapped Files
- Summary
- Practice Exercises
- Exercises
- Further Reading
- Bibliography

Chapter 14: File-System Implementation

- File-System Structure
- File-System Operations
- Directory Implementation
- Allocation Methods
- Free-Space Management
- Efficiency and Performance
- Recovery
- Example: The WAFL File System

- Summary
- Practice Exercises
- Exercises
- Further Reading
- Bibliography

Chapter 15: File-System Internals

- File Systems
- File-System Mounting
- Partitions and Mounting
- File Sharing
- Virtual File Systems
- Remote File Systems
- Consistency Semantics
- NFS
- Summary
- Practice Exercises
- Exercises

- Further Reading
- Bibliography

Chapter 16: Security

- The Security Problem
- Program Threats
- System and Network Threats
- Cryptography as a Security Tool
- User Authentication
- Implementing Security Defenses
- An Example: Windows 10
- Summary
- Exercises
- Further Reading
- Bibliography

Chapter 17: Protection

- Goals of Protection

- Principles of Protection
- Protection Rings
- Domain of Protection
- Access Matrix
- Implementation of the Access Matrix
- Revocation of Access Rights
- Role-Based Access Control
- Mandatory Access Control (MAC)
- Capability-Based Systems
- Other Protection Improvement Methods
- Language-Based Protection
- Summary
- Practice Exercises
- Exercises
- Further Reading
- Bibliography

Chapter 18: Virtual Machines

- Overview
- History
- Benefits and Features
- Building Blocks
- Types of VMs and Their Implementations
- Virtualization and Operating-System Components
- Examples
- Virtualization Research
- Summary
- Exercises
- Further Reading
- Bibliography

Chapter 19: Networks and Distributed Systems

- Advantages of Distributed Systems
- Network Structure
- Communication Structure
- Network and Distributed Operating Systems

- Design Issues in Distributed Systems
- Distributed File Systems
- DFS Naming and Transparency
- Remote File Access
- Final Thoughts on Distributed File Systems
- Summary
- Practice Exercises
- Exercises
- Further Reading
- Bibliography

12. Practice Test

Here's what you get

40	40
PRE-ASSESSMENTS QUESTIONS	POST-ASSESSMENTS QUESTIONS

Features

Each question comes with detailed remediation explaining not only why an answer option is correct but also why it is incorrect.

Unlimited Practice

Each test can be taken unlimited number of times until the learner feels they are prepared. Learner can review the test and read detailed remediation. Detailed test history is also available.

Each test set comes with learn, test and review modes. In learn mode, learners will attempt a question and will get immediate feedback and complete remediation as they move on to the next question. In test mode, learners can take a timed test simulating the actual exam conditions. In review mode, learners can read through one item at a time without attempting it.

13. Performance Based Labs

uCertify's performance-based labs are simulators that provides virtual environment. Labs deliver hands on experience with minimal risk and thus replace expensive physical labs. uCertify Labs are cloud-based, device-enabled and can be easily integrated with an LMS. Features of uCertify labs:

- Provide hands-on experience in a safe, online environment
- Labs simulate real world, hardware, software & CLI environment
- Flexible and inexpensive alternative to physical Labs
- Comes with well-organized component library for every task
- Highly interactive - learn by doing
- Explanations and remediation available
- Videos on how to perform

Lab Tasks

- Understanding the Storage-Device Hierarchy
- Understanding the Transition from User to Kernel Mode

- Understanding Types of Linked Lists
- Understanding the System Calls
- Understanding the Procedure of Executing a Program
- Understanding the Structure of Darwin
- Learning the Process State Diagram
- Understanding the Multithreading Models
- Understanding Dispatch Latency
- Understanding the Safety Algorithm
- Understanding Steps in Handling a Page Fault
- Understanding Page Replacement Algorithms
- Understanding the Types of Disk Scheduling Algorithms
- Understanding the Allocation Methods

Here's what you get

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PERFORMANCE BASED LAB

14. Post-Assessment

After completion of the uCertify course Post-Assessments are given to students and often used in conjunction with a Pre-Assessment to measure their achievement and the effectiveness of the exam.