SIDDAGANGA INSTITUTE OF TECHNOLOGY, TUMAKURU-572103

(An Autonomous Institute under Visvesvaraya Technological University, Belagavi)

Activity Based Learning (ABL 1) For the course

Operating Systems [S3CCSI01]

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1. ABSTRACT

The course provided a comprehensive introduction to the fundamentals of Operating Systems, emphasizing their critical role in managing hardware and software resources efficiently. It covered key concepts such as process scheduling, memory management, and file systems, helping to build a clear understanding of how an operating system functions as the backbone of computer performance. Through detailed explanations and structured lessons, the course highlighted how modern OS architectures enhance system performance, enable multitasking, and ensure effective resource utilization.

In addition to theoretical knowledge, the course offered interactive lab sessions through the Cisco Networking Academy platform, which provided practical, hands-on experience with core OS concepts. These sessions helped bridge the gap between theory and application, reinforcing problem-solving and analytical thinking. Overall, the course strengthened technical understanding while sharpening logical reasoning and troubleshooting skills essential for working with real-world operating systems and computing environments.

2. OVERALL VIEW OF COURSE

• The course was organized into five major modules, each covering essential concepts of Operating Systems in depth.

• Balanced theoretical lessons with practical lab exercises to strengthen real-world understanding.

• Offered comprehensive knowledge of resource management, process control, and data security.

• Explained how the Operating System functions as a communication bridge between hardware and software components.

• Connected traditional OS principles with modern advancements in cloud computing technologies for a broader perspective.

3. OBJECTIVES

• To understand the role and architecture of operating systems.
• To learn how processes are created, managed, and synchronized.
• To explore the concepts of memory and storage management.
• To understand file systems, security, and access control.
• To get introduced to virtualization and cloud computing concepts.
• To enhance problem-solving and analytical thinking through OS-based exercises.

4. EXPLANATION OF EACH MODULE

MODULE 1 – INTRODUCTION TO OPERATING SYSTEMS

This module provided a clear introduction to the basic concepts and functions of an Operating System (OS). It focused on understanding the purpose of an OS as the backbone of computer functionality and how it manages both hardware and software resources. The lessons explained the role of the OS as a **resource manager**, handling communication between users, applications, and hardware components to ensure smooth and efficient operation. Students also learned about the evolution of operating systems and how different types are designed to meet specific needs in computing environments.

Key topics covered in module-1:

- Explained core OS functions such as process, memory, file, and I/O management.
- Discussed major types of operating systems – **Batch**, **Multitasking**, **Real-Time**, and **Distributed**.
- Demonstrated how an OS ensures system stability, efficiency, and multitasking capability.
- Provided real-world examples including **Windows**, **Linux**, and **macOS** to connect theory with practice.

MODULE 2 – PROCESS MANAGEMENT

This module focused on understanding how an Operating System handles multiple processes efficiently. It explained how processes are created, executed, and terminated, emphasizing the importance of process management in achieving multitasking and optimal CPU utilization. Students learned about different process states and how the **Process Control Block (PCB)** stores vital information to track each process. The module also explored how the OS schedules processes to ensure fairness and efficiency in CPU allocation.

Key Topics Covered:

- Process creation, execution, and termination.
- Process states and structure of the **Process Control Block (PCB)**.
- CPU scheduling algorithms – **FCFS**, **SJF**, **Priority**, and **Round Robin**.
- Interprocess Communication (IPC) and synchronization using **semaphores**.
- Deadlock conditions, prevention techniques, and fair CPU allocation strategies.

MODULE 3 – MEMORY AND STORAGE MANAGEMENT

This module focused on how an Operating System efficiently manages both main and secondary memory to ensure smooth system performance. It explained the concepts of **main memory** and **virtual memory**, highlighting how the OS allocates and optimizes resources for active processes. Students learned about memory organization methods such as **paging** and **segmentation**, along with **page replacement algorithms** like FIFO, LRU, and Optimal, which help maintain efficient memory usage. The module also explored secondary storage and file management techniques, emphasizing how the OS ensures data access speed and storage reliability.

Key Topics Covered:

- Management of main memory and virtual memory.
- Concepts of **paging**, **segmentation**, and **page replacement algorithms** (FIFO, LRU, Optimal).
- Secondary storage management and **disk scheduling** techniques.
- **File allocation** methods and memory optimization strategies.
- Role of the OS in ensuring efficient and balanced resource utilization.

MODULE 4 – FILE SYSTEMS AND SECURITY

This module focused on how the Operating System manages files, directories, and overall data security within a computing environment. It explained how files are organized, accessed, and protected to ensure smooth system operation and data reliability. Students learned about various **file operations** such as creation, reading, writing, and deletion, along with different **directory structures** used for efficient data management. The module also emphasized the importance of security through authentication, access control, and encryption techniques that protect sensitive information from unauthorized access.

Key Topics Covered:

- File organization methods and directory structure management.
- File operations including **creation**, **reading**, and **deletion**.
- Security measures such as **authentication**, **access permissions**, and **encryption**.
- Concepts of **firewalls**, **user control**, and **data protection mechanisms**.
- Role of the Operating System in maintaining **system integrity** and **data confidentiality**.

MODULE 5 – VIRTUALIZATION AND CLOUD CONCEPTS

This module explored how modern Operating Systems integrate with virtualization and cloud technologies to enhance performance, scalability, and resource utilization. It introduced the concept of **virtualization**, explaining how hardware resources can be shared efficiently through **hypervisors**, **virtual machines (VMs)**, and **containers**. Students gained an understanding of how virtualization enables flexible deployment and management of computing environments. The module also covered various **cloud computing models** such as **IaaS**, **PaaS**, and **SaaS**, illustrating how these models support different levels of service delivery in the cloud.

Key Topics Covered:

- Fundamentals of **virtualization technologies** for resource sharing.
- Concepts of **hypervisors**, **virtual machines (VMs)**, and **containers**.
- Overview of **cloud computing models** – IaaS, PaaS, and SaaS.
- Real-world examples of cloud platforms like **AWS**, **Microsoft Azure**, and **Google Cloud**.
- Connection between **OS principles** and **modern distributed cloud systems**.

5. OUTCOMES

After completing this course, I gained:

• A clear understanding of OS architecture and working principles.

• Practical knowledge of process scheduling and memory management.

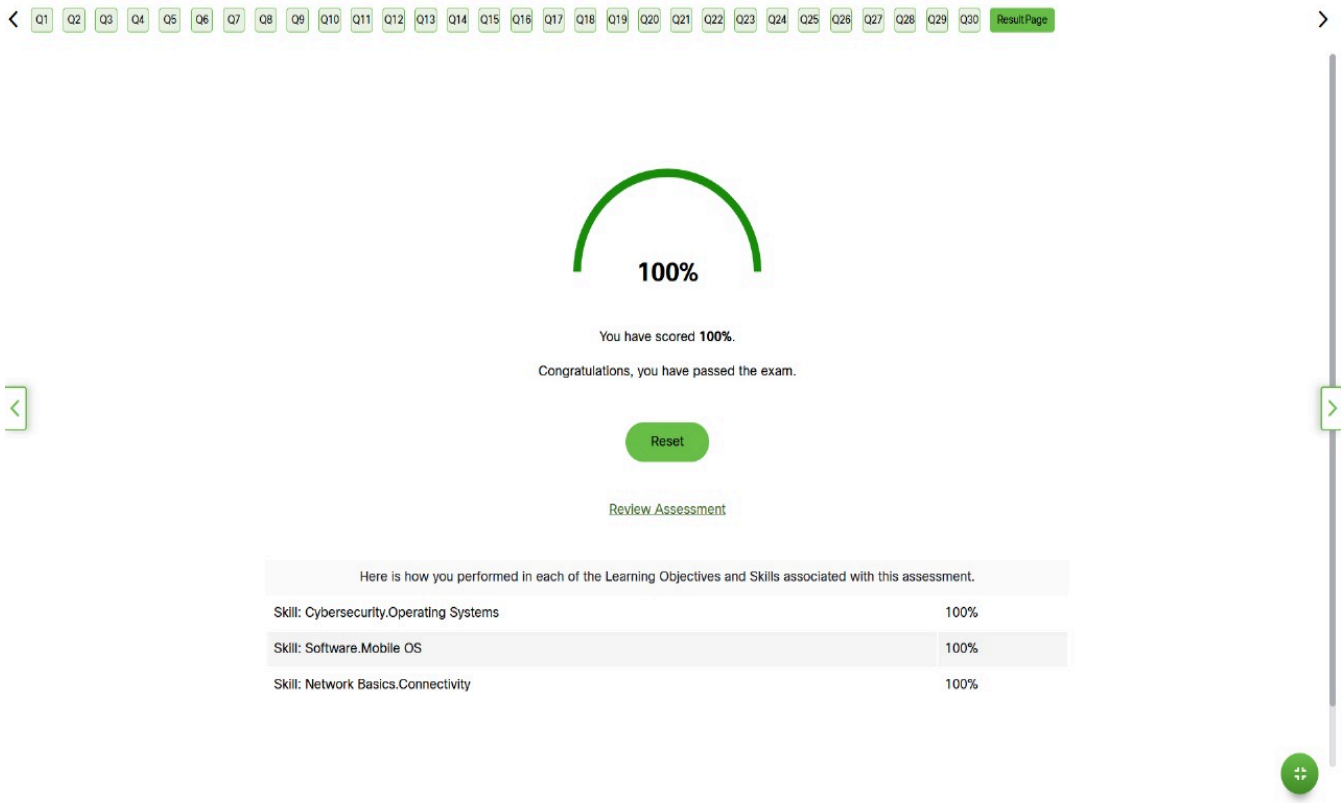
• Awareness of file systems, data security, and access control.

• Understanding of virtualization and cloud integration.

• Improved analytical, problem-solving, and self-learning skills.

• Confidence to apply OS principles in real-world environments.

FINAL QUIZ ATTENDANCE SCREENSHOT



6. CERTIFICATE

Below is the official Cisco Networking Academy course completion certificate for Operating Systems Basics.

Networking Academy

This certificate is awarded to

Sohail Akhtar

for successfully completing

Operating Systems Basics

offered by Networking Academy
through the Cisco Networking Academy program.

Lynn Bloomer
Director
Cisco Networking Academy

22 Oct 2025
Completion Date