Unit 50: Operating Systems

Unit code	**H/618/7486**
Unit level	**5**
Credit value	**15**

Introduction

Although many computer users do not interact directly with systems software and hardware, it is important that computing students have the opportunity to learn about these underlying systems.

MS-DOS, Windows, UNIX, Linux, Android, OS2, MacOS are just a few examples of different types of both modern and legacy operating systems. The foundation of most, if not all of them, is MS-DOS (Microsoft Disk Operating System). Way back in the 1980s, this was used as the first operating system for personal computers (PCs). In the 1990s, MS-DOS was transformed to a GUI (Graphic User Interface) WSWIG (What You See Is What You Get) operating system through the release of Windows 3.11/Windows for Workgroups. That has led to several iterations of the Windows Operating System.

This unit introduces students to different operating systems such as DOS, Windows, UNIX and Linux. The topics covered are: the tasks of operating systems such as controlling and allocating memory, prioritising system requests, controlling input and output devices, facilitating data networking and managing files, including security and protection.

Among the topics included in this unit are: the history and evolution of operating systems; the definition of an operating system; why operating systems are needed; how operating systems started and developed; operating systems management roles; management of memory, processes, processors, devices and files; security and protection: user security, device, application and process protection; inter-process communication; comparison of operating systems; distributed and networked systems; concurrent systems; multi-user systems; graphical interface systems; and practical application of operating systems: user interface commands of major operating systems; installations and extensions of operating systems.

On successful completion of this unit, students will be able to operate any given operating system competently and undertake routine maintenance and optimisation of operating systems. As a result, they will develop skills such as communication literacy, critical thinking, analysis, reasoning and interpretation, which are crucial for gaining employment and developing academic competence.

Learning Outcomes

By the end of this unit students will be able to:

LO1   Investigate different operating systems, their functions and user interfaces

LO2   Explore the processes managed by an operating system

LO3   Demonstrate the use of DOS, Windows, UNIX and Linux.

LO4   Analyse appropriate techniques and technologies used in distributed and concurrent systems.

Essential Content

LO1 Investigate different operating systems, their functions and user interfaces

The history and evolution of operating systems:

How operating systems started and developed.

The history of operating systems from legacy operating systems to current operating systems including the development from batch files to modern operating systems.

Operating system role:

What is meant by an operating system.

Understand why operating systems are needed.

Similarities and differences between operating systems and firmware.

LO2 Explore the processes managed by an operating system

Operating systems management:

Memory management including virtual memory.

Scheduling and process scheduling in operating systems including various CPU scheduling algorithms.

Concurrent processing.

Device management.

File management.

Resource management.

The functions of IoT operating systems including overview of IoT operating systems and firmware.

LO3 **Demonstrate the use of different operating systems with a range of commands**

Operating system knowledge:

Commands for manipulating a range of different operating systems, e.g. MS-DOS, Windows, UNIX, Linux.

Demonstration of operating systems tasks e.g. creating or removing a directory.

Operating systems' environments, including distributed operating systems concurrent operating systems.

Security and communications:

How secure different operating systems are including different environments and the conditions of use.

Functional and logical architecture of IoT Platforms, e.g. Huawei's OceanConnect, Amazon Web Services (AWS), Google Cloud Platform,
IBM Watson IoT, Microsoft Azure.

Common IoT communication protocols, CIG functions and architecture, features of IoT platforms.

LO4 **Examine how operating systems will function in the future and the implications on security**

Future of operating systems:

Consider desktops, laptops, smartphones and other devices in terms of operating systems development environment.

Introduction of artificial intelligence and impact on operating systems development e.g. mobile operating systems like Android and iOS equipped with AI-based voice assistants,

Connectivity e.g. Internet of things

Support for cloud computing and outsourcing of operating system functions in the cloud.

Open source operating systems and their impact on future development projects.

Review trends in virtualisation, emulation and use of sophisticated operating systems in mobile systems.

Security e.g. biometrics

Multi-modal interaction e.g. touch, type, speech.

User centred design

Automation of common tasks based on user habits

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Investigate different operating systems, their functions and user interfaces		
P1 Summarise what an operating system is and how it works with reference to different examples. **P2** Research the evolution of operating systems.	**M1** Discuss the importance of operating systems.	**D1** Evaluate the functionality, interface design and processes of a range of operating systems.
LO2 Explore the processes managed by an operating system		
P3 Research the process of memory management in an operating system. **P4** Investigate the process of job scheduling.	**M2** Illustrate the importance of resource management in an operating system to aid its efficiency.	
LO3 Demonstrate the use of different operating systems with a range of commands		
P5 Demonstrate common commands on different operating systems. **P6** Compare how different commands are carried out on different operating systems.	**M3** Analyse the security of different operating systems	**D2** Evaluate the role of different operating system in meeting the needs of future technologies and the implications on security.
LO4 Examine how operating systems will function in the future and the implications on security		
P7 Explore the core features modern operating systems will require to meet future needs.	**M4** Assess how the features of modern operating systems will support the development of future needs.	

Recommended Resources

Textbooks

Arpaci-Dusseau R.H., Arpaci-Dusseau, A.C. (2018) *Operating Systems, Three Easy Pieces.* CreateSpace Independent Publishing Platforms.

Davis, W. S. and Rajkumar, T. M. (2005) *Operating Systems: A Systematic View*. 6th Ed. Harlow, Addison-Wesley.

McHoes, A. M. and Flynn, I. M. (2017) *Understanding Operating Systems*.
8th Ed. Course Technology.

Tanenbaum, A. S. (2016) *Modern Operating Systems*. 4th Ed. India. Pearson.

Tomsho, T. (2016) *Guide to Operating Systems*. 5th Ed. Boston. Cengage Learning

Woodhull, A. S. and Tanenbaum, A. S. (2006) *Operating Systems: Design and Implementation*. 3rd Ed. Upper Saddle River. Prentice Hall.

Links

This unit links to the following related unit:

Unit 40: Client/Server Computing Systems.