THE OPEN UNIVERSITY OF KENYA

DESIGN PLAN

Programme title	Bachelor of Science in Cybersecurity and Digital Forensics
Course title	Operating Systems
Learning Module number	01
Learning module title	Introduction to Operating Systems
Module Developer	Elisha Abade
Module duration in hours	8
Instructional Hour Equivalent (Divide duration by 2)	4
Reviewed by	
Vision	The innovative university for inclusive prosperity
Audience description	This module is intended for learners of Cyber Security who would wish to acquire knowledge on the fundamental concepts of Operating Systems as used in Computer Systems.
Instructions to learners ⓘ	In this course we shall be learning about the basic concepts of an Operating System. We'll begin by watching videos on Operating systems. You are encouraged to ensure that you have access to a reliable Internet and that your devices (computer, tablet or phone) have properly working multimedia systems. This module also presents a number of interactive and non-interactive activities. You will be required to complete all the activities.
Learning module description	This module aims to facilitate learners to have an understanding of the fundamental concepts of Operating Systems such as the history and evolution of Operating Systems as well as functions, structure and components of an Operating System.
Module objectives:	This module aims at facilitating learners to acquire knowledge about: 1. The definition of an operating system 2. Types of Operating Systems 3. History and evolution of Operating Systems 4. Strategies for implementing Operating Systems
Module learning outcomes:	By the end of the module, you should be able to: 1. Define an Operating System 2. Explain the evolution of Operating Systems

	3. Describe the functions of an Operating System 4. Appraise strategies for implementing Operating Systems
Planned Learning Resources	
ACTIVITY 1: INTRODUCTION VIDEO 1: Pre-recorded lecture on topic emphasizing LEARNING OUTCOME 1: Factual knowledge.	**Video 1: Course Introduction and overview to Operating Systems (8 minutes)** **Introduction to Operating Systems** Welcome to this first module of the Operating Systems course. In this module, we will learn about: 1. What an Operating System is and why it is important in computer systems 2. Evolution of Operating Systems 3. Types of Operating Systems 4. Structure and Components of an Operating System and 5. The functions of an operating system Computer systems comprise both hardware and software. The hardware components of a computer system include one or more processors, main memory, hard disks, a display unit, network interfaces and peripherals such as printers, a keyboard, a mouse, as well as various other input/output devices. In this module, we will mostly focus on the software component. Computer software can broadly be classified into two categories, namely: 1) Application software and 2) System software Application software consists of the set of programs that perform tasks that are particular to the computer systems's utilization. Additionally, they are commonly visible to the user. Some examples of application software include text editors such as Microsoft Word, spreadsheets such as Microsoft Excel and database applications. System software on the other hand refers to a set of software that is more transparent to the user of the computer system but provides a conducive programming environment in which application developers create their applications. An Operating System is arguably the most common form of system software. It acts as an intermediary between the computer hardware and the application software. **System vs Application Software** Typically, a computer system can be seen in a layered format as shown below: ***A graphical Illustration to be inserted here:*** ***Instructions to graphic designers:*** ***A figure that has three concentric layers organized as follows:***

Inner layer:

Label: Hardware

Examples: Processor (CPU), Memory, Disks, I/O Devices eg. Mouse and Keyboard, Buses

Middle layer:

Label: System Software

Examples: Operating System, Utilities such as drivers.

Outer layer:

Label: Application software

Examples: Text editors, Spreadsheets, Databases, Browsers, Games etc

Functions of an Operating System

The key functions of an Operating System are:

1) Managing the core operations of the computer system. These include accepting input from users via keyboard or touch screen and displaying output to users on the screen, managing files and folders on the disk, regulating access to other peripherals such as printers.
2) Regulating utilization of computing resources such as memory and ensuring that different programs get their right share of resources without interfering with each other.
3) Providing an abstraction of the underlying hardware and its associated complexities.

At this point, most of us have already interacted with Operating Systems in one way or the other. Some of these Operating Systems include Windows, Linux, MacOS and various UNIX flavours such as FreeBSD. Due to various versions of these operating systems, their appearances might be varying.

In the next session, we shall be going down the memory lane to have a look at how the computer Operating System has transformed over the years.

Video 2: Evolution of Operating Systems: (8 minutes)

Welcome to the second session of this module. In this session, we shall be looking at the history of Operating Systems. This will help us to understand how the Operating System has evolved over the years to what we have today.

Evolution of Operating Systems:

The Operating System has gone through several generations of evolution over the years. Today's operating systems can be considered to belong to the fifth generation. The first generation of Operating systems were used between 1945 and 1955, during a time

	in which the core technology for computer systems was vacuum tubes. ***A graphical illustration of a vacuum tube and vacuum tube computers to be inserted here.*** The second generation then followed and were in operation between 1955 and 1965. During this period, the core technology for computer systems was transistors and batch processing systems. The computers in this generation were mainly what is referred to as mainframe computers. These computers were so expensive that only large corporations or major government agencies or universities could afford to purchase them. IBM 1401 and IBM 7094 are some of the mainframe computers that run on the second generation Operating Systems. ***A graphical illustration of IBM 1401 or IBM 7094 and processing of batch jobs to be inserted here.*** Advances in technology led to migration from transistors and batch processing into the era of Integrated Chips (ICs) and use of Multiprogramming systems. This was between 1965 and 1980s and this period defined the third generation of Operating Systems. The first major computer line to use ICs was the IBM 360. These computers also came about with several key techniques that were absent in second-generation operating systems, the most important of which was multiprogramming. Multiprogramming is the ability of an operating system to execute more than one program using a single processor. ***A graphical illustration of IBM 360 to be inserted here.*** The fourth generation of Operating Systems began in the 1980s and peaked in the early 1990s. This saw the advent of Personal Computers and their associated Operating Systems. This era was characterized with the development of LSI (Large Scale Integration) circuits which are chips containing thousands of transistors on a square centimeter of silicon. Some of the Operating Systems in this generation include: MS-DOS, Windows 95/98, Windows NT, MacOS X, Windows Me, various Linux flavours, Unix flavours such as FreeBSD. ***A graphical illustration of logos of the above Operating Systems to be inserted here.***

	Technically, the fourth generation evolution is still in force even though the fifth generation of Operating Systems also began to unfold from the 1990s to present. The fifth generation of Operating Systems has seen the advent of Mobile Computers. The first real smartphone appeared in the mid-1990s when Nokia released the N9000. Nokia N9000 actually combined a phone and a PDA (Personal Digital Assistant). In 1997, Ericsson coined the term smartphone for its GS88 ‘‘Penelope.’’ This generation saw the advent of Operating Systems such as Symbian OS,RIM’s Blackberry OS, Apple’s iOS and then Android. In the next session, you will be learning about the strategies that have been adopted in implementing Operating Systems. **Video 3: Strategies for implementing Operating Systems (5 minutes)** In this third session of this first module of the course in Operating Systems, we shall be looking at the various strategies that are applied in implementing Operating Systems. Modern day Operating Systems are built on four different strategies, namely: batch, timesharing, personal computing, and dedicated. **Batch:** The batch processing strategy was the earliest approach which involved reading a series of jobs into the machine which then runs the jobs one at a time. The series of jobs is what is referred to as a batch. In this strategy, users do not interact with the programs while they are being processed. **Timesharing:** The next strategy is referred to as timesharing. In this approach, computers allow for multiple interactive users to use it. Instead of preparing jobs to be executed in batches with no interaction during execution, users establish interactive sessions with computers and issue commands, programs and data as required during the interactive session. **Personal Computing**: In the Personal Computing strategy, a single user runs multiple programs on a dedicated computer. It is only one person using the machine at a time hence more attention is given to getting predictable responses from the system. This is commonly used by today’s personal computers. **Dedicated**: The final strategy is dedicated operating systems. It supports real-time and process control systems. They are used in specialized application areas such as industrial control systems, air traffic control systems and robots. They must guarantee certain response times for particular computing tasks.

ACTIVITY 2: READING READING MATERIAL 1 	You are required to read more about Operating Systems from the materials provided in this section. You are also free to read widely from other sources that are not necessarily included in this module. **Definition of an Operating System** Andrew S Tanenbaum. (2016). Modern Operating Systems Paperback. Pearson. pp 3 -5 https://www.amazon.com/Modern-Operating-Systems-Andrew-Tanenbaum/dp/9332575770#detailBullets_feature_div **Evolution of Operating Systems** Andrew S Tanenbaum. (2016). Modern Operating Systems Paperback. Pearson. pp 6 - 19 https://www.amazon.com/Modern-Operating-Systems-Andrew-Tanenbaum/dp/9332575770#detailBullets_feature_div
ACTIVITY 3: Comprehension questions: 	1. What are the two main functions of an operating system? 2. What is the difference between timesharing and multiprogramming systems? 3. Explain the idea of “family-of-computers” and in which period was it introduced in computing? 4. Is this idea of “family-of-computers” now dead or does it live on?
LEARNING OUTCOME 2: Conceptual knowledge ACTIVITY 4: Video to be used.	
CASE 1: 	A local research institution maintains a science and technology park (museum) that is used to preserve a number of technological artifacts. John, a local resident visited the museum and saw several computers which are archived but got interested in this particular one labeled, “long live, PAPA”. The curator explained to John that PAPA was a great invention of its time. It was “super fast” and

	generated less heat when in operation. However, PAPA was not the giant its forefathers used to be. Upon prodding, the curator explained that it was possible because PAPA used a different technology referred to as Integrated Chips, unlike its fore fathers that used vacuum tubes. PAPA also made it easy to use high level programming languages. Therefore PAPA failed to understand the "batching" language of its forefathers. 1. Estimate the period within which PAPA was actively used as described by the curator. 2. If PAPA did not understand the "batching" language then how did its users interact with it? 3. Give FIVE possible languages that PAPA spoke in its heyday. 4. In as much as we are told PAPA did not emit a lot of heat, it was still necessary for it to remain cool. 5. How did PAPA store data?
ACTIVITY 5: READING MATERIAL 	**1) Types of Operating Systems (With OS Functions and Examples)** https://www.indeed.com/career-advice/career-development/types-of-operating-systems **2) Types of Operating Systems** https://www.geeksforgeeks.org/types-of-operating-systems/ https://www.javatpoint.com/types-of-operating-systems **3) Functions of Operating Systems** https://www.geeksforgeeks.org/functions-of-operating-system/ a) Having read the above articles, you are required to write a blog in the LMS with focus on different ways of classifying Operating Systems.
ACTIVITY 6: ONLINE DISCUSSION 	Your course instructor will create a discussion forum in the LMS to facilitate online group discussions. You are required to read the discussion topic and give comments. You are also encouraged to comment on contributions from at least three members of your group. You can use the LMS platform to send questions to your instructor on the discussion topics that he/she has posted on the LMS.

LEARNING OUTCOME 3: PRACTICAL SKILLS VIDEO 3: 	Watch the 16 minutes video in this link for more information about Operating Systems. The following topics have been presented in the video: 1. Introduction to Operating System 2. What is an Operating System 3. Types of Operating System 4. Functions of Operating System 5. Goals of Operating System **A look at specific examples of Operating Systems** 1. MS Windows (4 minutes) 2. Linux (4 minutes) 3. Mac OS X (5 minutes)
ACTIVITY 7: Learner practice sessions	In this module you have learnt about the operating system, its functions, components and the different approaches that are used in organizing the various components into a single software system. 1. You are required to write a *blog* focusing on the "*Functions of an Operating System*". a. Grading: The blogs will be graded through mutual rating by your peers. Therefore ensure that you "popularize" your blog by sharing with your users.
ASSESSMENT OF PRACTICAL SKILL:	In this session, you are required to do a "lightning talk" focusing on the structure of operating systems. In the "lightning talk", use your smartphone or any other video camera to record yourself in not more than "40 seconds" while explaining the different "***structures for Operating Systems***". Note: 1. Upload your video with the captions <*fname_lname_talk1*>. where "*fname*" is your first name and "*lname*" is your last name (or surname). 2. The video must not be more than 40 seconds long.
LEARNING OUTCOME 4: KEY/TRANSFERABLE SKILLS	In the Operating Systems course, there are several concepts that you should be able to use simple, effective diagrams or event posters to illustrate. 1. Watch this 5-minute video that gives you tips on how to design effective posters. 2. You can also do further reading about effective poster design here in this link: https://www.birmingham.ac.uk/schools/metallurgy-materials/about/cases/tips-advice/poster.aspx

ACTIVITY 8	There are at least four strategies for implementing an Operating System, namely: *Batch, Time-sharing, Personal computing and dedicated* approaches. In this activity, you are required to use a poster (one-page pictorial representation) to illustrate these strategies. The poster should be titled, "*OS Implementation Strategies*". Your instructor will create an "activity" in the LMS in which you will be required to upload the "*OS Implementation Strategies*" poster that you had sketched above. The poster will be assessed by a "rating" strategy based on a scale that will be defined in the LMS so be careful to come up with an effective poster.
QUIZZ: 	1. Which of the following is not an operating system? A). Solaris B). Windows XP C). Oracle D). NetBSD 2) What is the primary job of the operating system is a computer? a. Command resources b. Manage resources c. Provide utilities d. Be user friendly 3. Which of the following is/are the functions of an operating system? i) Sharing hardware among users. ii) Allowing users to share data among themselves. iii) Recovering from errors. iv) Preventing users from interfering with one another. v) Scheduling resources among users. a) i, ii, iii and iv only b) ii, iii, iv and v only c) i, iii, iv and v only d) All i, ii, iii, iv and v 4. Which of the following is considered a resource that may be allocated by the operating system? A). Bus B). CPU C). File system D). Instruction register 5. Which of the following is not a resource that may be allocated by the operating system? A). CPU B). File system

	C). Memory D). Storage device View AnswerCorrect: B Answers: 1. c. Oracle 2. b. Manage resources 3. d) All i, ii, iii, iv and v 4. b. CPU 5. b. File System **Pass Mark**: 80%
TAKE HOME MESSAGE	Your course instructor will create a feedback section in the LMS to facilitate provision of your take home message. You are required to give a brief description of what you have learnt in this module in not more than half a page (typed) in the feedback section provided.
Reference list	1. Andrew S Tanenbaum. (2016). *Modern Operating Systems Paperback, 5th Edition*. Pearson. 2. Silberschatz A., Galvin P. B. and Gagne G. (2008). *Operating System Concepts*, 8th Edition. Wiley. ISBN: 9780470128725 3. Meyers, M. (2016). *CompTIA A+ Certification Guide*. McGraw-Hill Education