**Bayero University, Kano**

**Faculty of Computing**

**Department of Information Technology**

**B.Sc. Cyber Security**

**Proposed 30% addition to the CCMAS Course Structure**

**Level 100**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title** | **Unit** | **Status** | **LH** | **PH** |
| BUK-COS 101 | Introduction to Application Packages | 2 | C | 15 | 45 |
| BUK-ICT 102 | Introduction to Information and Communication Technology | 2 | C | 30 | 0 |
| BUK-COS 103 | Introduction to Computer Programming | 3 | C | 30 | 45 |
|  | Total | **7** |  |  |  |

**Level 200**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title** | **Unit** | **Status** | **LH** | **PH** |
| BUK-CSC 201 | Data Structures | 3 | C | 30 | 45 |
| BUK-CSC 202 | Algorithms and Complexity Analysis | 2 | C | 30 | 0 |
| BUK-IFT 212 | Computer Architecture and Organization | 2 | C | 15 | 45 |
| BUK-MTH 223 | Number Theory | 2 | C | 30 | 0 |
|  | Total | **9** |  |  |  |

**Level 300**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title** | **Unit** | **Status** | **LH** | **PH** |
| BUK-DTS 304 | Data Management I | 3 | C | 30 | 45 |
| BUK-ICT 305 | Data Communication Systems and Network | 3 | C | 30 | 45 |
| BUK-CSC 308 | Operating Systems | 3 | C | 30 | 45 |
|  | Total | **9** |  |  |  |

**Level 400**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title** | **Unit** | **Status** | **LH** | **PH** |
| BUK-CYB 401 | Network Security | 3 | C | 30 | 45 |
| BUK-CYB 402 | Malware Analysis | 3 | C | 30 | 45 |
| BUK-IFT 434 | Blockchain Technology and Application | 3 | C | 30 | 45 |
| BUK-SEN 403 | Open-Source Software Development and Applications | 2 | E | 15 | 45 |
|  | Total | **11** |  |  |  |
|  |  | **36** |  |  |  |

**Bayero University, Kano**

**Faculty of Computing**

**Department of Information Technology**

**B.Sc. Cyber Security**

**Proposed 30% addition to the CCMAS Course Structure**

Bayero University Kano **(**BUK**)**

Computing

Department of Information Technology

B.Sc. Cyber Security

**BUK-COS 101 Computer Application Packages. (2 Unit; Core; LH=15, PH=45)**

**Senate-approved relevance**

This course is designed in line with the vision and mission of Bayero University Kano to provide high quality instruction to our students, and equip them with the state-of-the-art knowledge and skills in computer science that they need to take up real-world challenges. To conduct cutting-edge research in areas of national need, frequently in collaboration with other disciplines.

**Overview**

This course is aimed at beginning to intermediate computer users. It teaches a range of computer skills from the basics of using Windows, to basic internet literacy, to creating projects using Microsoft Office. Assignments show step-by-step visuals to help student’s complete projects, and include integration across Microsoft Word and Excel. This course will apply learning sciences to engage students and better support the learning process. The material is aimed to deliver an active learning experience. They include text, images, videos, assessments, directed feedback, and practice questions that invite students to apply their knowledge, improve their understanding, and perform better.

**Objectives**

The objectives of the course are to:

1. Describe navigation and perform common tasks in Word, such as opening, viewing, editing, saving, and printing documents, and configuring the application.
2. Discuss formatting text, paragraphs and repetitive operations efficiently using tools such as Find and Replace, Format Painter, and Styles.
3. Enhance lists by sorting, renumbering, and customizing list styles, create and format tables.
4. Outline graphic objects into a document, including symbols, special characters, illustrations, pictures, and clip art, format the overall appearance of a page through page borders and colors, watermarks, headers and footers, and page layout.
5. Learn working with Multiple Worksheets and performing computations in Worksheets.

**Learning Outcomes**

The students shall be able to:

1. Select the most appropriate software to use to complete a task
2. Identify the key features of a word processor and spread sheet application
3. Apply the key features of a word processor to format a text, paragraph and document
4. Evaluate formatting techniques to understand why we format documents
5. Develop and apply fundamental spreadsheet skills. And demonstrate proficiency in using moderately complex spreadsheet tools such as tables and chart

**Course Contents**

Introduction to Computer Application; what are computer application packages, types of computer application packages Overview of popular computer application packages. Microsoft Office Suite Microsoft Word; Creating, editing, and formatting documents, working with tables, graphics, and charts, collaborating on documents. Microsoft Excel; Creating, editing, and formatting spreadsheets, working with formulas and functions, Creating charts and graphs Microsoft PowerPoint; Creating, editing, and formatting presentations, Adding multimedia elements, Delivering presentation.

**Minimum Academic Standards**

Cyber Security programme’s NUC-MAS requirement facilities.

Bayero University Kano **(**BUK**)**

Computing

Department of Information Technology

B.Sc. Cyber Security

**BUK-ICT 102 Introduction to Information and Communication Technology. (2 Unit; Core; LH=30)**

**Senate-approved relevance**

This course is designed in line with the vision and mission of Bayero University Kano to provide high quality instruction to our students, and equip them with the state-of-the-art knowledge and skills in computer science that they need to take up real-world challenges. To conduct cutting-edge research in areas of national need, frequently in collaboration with other disciplines.

**Overview**

The Fundamentals of Information Technology course is designed to provide students with an understanding of the basic principles of computing and information technology. The course covers a wide range of topics, including computer hardware and software, computer networks and the internet, database management systems, programming languages, and cybersecurity.

Throughout the course, students will have the opportunity to apply what they have learned through hands-on exercises and projects. They will also be introduced to tools and technologies commonly used in the field of information technology, such as software development environments, network monitoring tools, and database management systems. Overall, the Fundamentals of Information Technology course provides students with a solid foundation in the principles of computing and information technology, preparing them for further study in the field or for entry-level positions in the IT industry.

**Objectives**

The objectives of the course are to:

1. Develop a basic understanding of the history and evolution of information technology and its impact on society.
2. Apply knowledge of computer hardware and software components, including the ability to identify, install, and configure computer hardware.
3. Apply knowledge of emerging trends in information technology, such as cloud computing, artificial intelligence, and the internet of things.
4. Explain the ethical and social implications of information technology and its impact on society.
5. Discuss the impact of ICT on society, including ethical and legal issues.

**Learning Outcomes**

The students shall be able to:

1. Identify components of the computer and know-how the components communicate;
2. Apply the concept of data transfer and memory types and management and be comfortable with graphics processing;
3. Identify and be able to use different communication ports and know the software types;
4. State different computer network topologies and their sizes; and
5. Operate office applications and the internet.

**Course Content**

Basic principle of computers. Computer "backbone". Data transmission. Random Access Memory. Permanent Memory. Graphic processing. Communication Ports. Input and Output Devices. Software types. Accessibility options. Computer types. Portable digital devices. Network Types. Internet. Instant messaging. Voice over Internet Protocol. Really Simple Syndication. Network communication. Internet data transfer. Data rate units. Internet access. Virtual (online) communities. Computer in the workplace. Telecommuting (telework).

**Minimum Academic Standards**

Cyber Security programme’s NUC-MAS requirement facilities.

Bayero University Kano **(**BUK**)**

Computing

Department of Information Technology

B.Sc. Cyber Security

**BUK-COS-103 Introduction to Computer Programming. 3 Unit, Core, LH=30, PH=45**

**Senate approved relevance**

This course is designed in line with the vision and mission of Bayero University Kano to provide high quality instruction to our students, and equip them with the state-of-the-art knowledge and skills in computer science that they need to take up real-world challenges. To conduct cutting-edge research in areas of national need, frequently in collaboration with other disciplines**.**

**Overview**

In this course, students will learn how Python works and its place in the world of programming languages; to work with and manipulate strings; to perform math operations; to work with Python sequences; to collect user input and output results; flow control processing; to write to, and read from, files; to write functions; to handle exception; and work with dates and times.

**Objectives**

The objectives of the course are to:

1. Explain why Python is a useful scripting language for developers

2. Develop and program Python applications.

3. Discuss how to use lists, tuples, and dictionaries in Python programs and identify Python object types.

4. Explain how to use indexing and slicing to access data in Python programs, write loops and decision statements in Python.

5. Apply functions and pass arguments in Python, build and package Python modules for reusability and read and write files and design object‐oriented programs with Python classes

**Learning outcome**

The students will be able to:

1. Create basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions

2. Create indexing and slicing to access data in Python programs

3. Create user input to create fun and interactive programs

4. Create simple games with images, animations, and audio using our custom beginner-friendly programming library, Wizardlib

5. Create and manipulate files

**Course Content**

Vital Python – Math, Strings, Conditionals, and Loops. Vital Python. Numbers: Operations, Types, and Variables. To Open a Jupyter Notebook. Python as a Calculator. Standard Math Operations. Basic Math Operations. Order of Operations. Spacing in Python. Number Types: Integers and Floats. Complex Number Types. Errors in Python. Variables. Variable Assignment. Changing Types. Reassigning Variables in Terms of Themselves. Variable Names. Multiple Variables. Comments. Docstrings. Theorem in Python. Strings: Concatenation, Methods, and input(). String Syntax. Escape Sequences with Quotes. Multi-Line Strings. The print() Function. String Operations and Concatenation. String Interpolation. Comma Separators. Format. The len() Function. String Methods. Casting. The input() Function. String Indexing and Slicing. Indexing. Slicing Strings and Their Methods. Booleans and Conditionals. Booleans. Logical Operators. Comparison Operators. Comparing Strings. Conditionals. The if Syntax. Indentation. if else. The elif Statement. Loops. The while Loops. An Infinite Loop. break. Programs. The for Loop. The continue Keyword. Python Structures. The Power of Lists. List Methods. Accessing an Item from a List. Adding an Item to a List. Dictionary Keys and Values. a List and a Dictionary. Zipping and Unzipping Dictionaries Using zip(). Dictionary Methods. Tuples. A Survey of Sets. Set Operations. Choosing Types. Executing Python – Programs. Algorithms, and Functions Introduction. Python Scripts and Modules.

**Minimum Academic Standards**

Cyber Security programme’s NUC-MAS requirement facilities.

Bayero University Kano **(**BUK**)**

Computing

Department of Information Technology

B.Sc. Cyber Security

**BUK-CSC 201 Data Structures, 3 Unit, Core, 30 LH, 45 PH**

**Senate-approved relevance**

This course is designed in line with the vision and mission of Bayero University Kano to provide high quality instruction to our students, and equip them with the state-of-the-art knowledge and skills in computer science that they need to take up real-world challenges. To conduct cutting-edge research in areas of national need, frequently in collaboration with other disciplines.

**Overview**

A data structure is a specialized format for organizing, processing, retrieving and storing data. There are several basic and advanced types of data structures, all designed to arrange data to suit a specific purpose. Data structures make it easy for users to access and work with the data they need in appropriate ways.

**Objectives**

The objectives of the course are to:

1. Impart the basic concepts of data structures and algorithms

2. Express importance of data structures in context of writing efficient programs.  
3. Describe concepts about searching and sorting techniques  
4. Describe basic concepts about stacks, queues, lists, trees and graphs  
5. Demonstrate about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

**Learning Outcomes**

At the end of this Course, students should be able to:

1. Discuss the appropriate use of built-in data structures;

2. Apply object-oriented concepts (inheritance, polymorphism, design patterns, etc.) in software design;

3. Implement various data structures and their algorithms, and apply them in implementing simple applications;

4. Choose the appropriate data structure for modelling a given problem;

5. Analyze simple algorithms and determine their efficiency using big-O notation; and

6. Apply the knowledge of data structures to other application domains like data compression and memory management.

**Course Content**

Primitive types, Arrays, Records Strings and String processing, Data representation in memory, Stack and Heap allocation, Queues, TREES. Implementation Strategies for stack, queues, trees. Run time Storage management; Pointers and References, linked structures.

**Lab work:** Writing C+/C++ functions to perform practical exercises and implement using the algorithms on arrays, records, string processing, queues, trees, pointers and linked structures.

**Minimum Academic Standard**

Cyber Security programme’s NUC-MAS requirement facilities.

Bayero University Kano **(**BUK**)**

Computing

Department of Information Technology

B.Sc. Cyber Security

**BUK-CSC 202 Algorithms and Complexity Analysis, 2 Unit, Core, 30 LH**

**Senate-approved relevance**

This course is designed in line with the vision and mission of Bayero University Kano to provide high quality instruction to our students, and equip them with the state-of-the-art knowledge and skills in computer science that they need to take up real-world challenges. To conduct cutting-edge research in areas of national need, frequently in collaboration with other disciplines.

**Overview**

This course on Analysis of Algorithms provides students with a comprehensive understanding of the principles and techniques used in analyzing the efficiency of algorithms. The course begins with an introduction to the role of algorithm analysis in computer science and the use of asymptotic notation for analyzing the running time of algorithms. The course covers sorting algorithms, including insertion sort, selection sort, bubble sort, merge sort, quicksort, and heapsort, with a comparison of their efficiency.

**Objectives**

The objectives of the course are to:

1. Discuss the basics of algorithm analysis: Learn how to evaluate the efficiency of algorithms in terms of time and space complexity.
2. Master the mathematical techniques used in algorithm analysis: Develop proficiency in asymptotic notation, recurrence relations, and other mathematical tools commonly used in algorithm analysis.
3. Describe common algorithm design techniques: Study common algorithm design techniques such as divide and conquer, dynamic programming, and greedy algorithms.
4. Identify the limitations of algorithmic efficiency: Learn about NP-complete problems and the limits of efficient algorithmic solutions.
5. Analyze real-world algorithms: Analyze real-world algorithms and understand how their efficiency affects their practical use and scalability.

**Learning Outcomes**

The students shall be able to

1. Students will be able to evaluate the efficiency of algorithms in terms of time and space complexity using asymptotic notation and other mathematical tools.
2. Students will be able to design and analyze algorithms using common algorithm design techniques such as divide and conquer, dynamic programming, and greedy algorithms.
3. Students will be able to analyze real-world algorithms and understand how their efficiency affects their practical use and scalability.
4. Students will be able to apply algorithm analysis to optimize software systems and identify performance bottlenecks.
5. Students will be able to evaluate the performance of data structures such as arrays, linked lists, trees, and hash tables.

**Course Content**

Basic algorithmic analysis. Asymptotic analysis of Upper and average complexity bounds. Standard Complexity Classes. Time and space trade-offs in analysis recursive algorithms. Algorithmic Strategies. Fundamental computing algorithms. Numerical algorithms. Sequential and Binary search algorithms. Sorting algorithms, Binary Search trees. Hash tables. Graphs and their representation.

**Minimum Academic Standard**

Cyber Security programme’s NUC-MAS requirement facilities.

Bayero University Kano **(**BUK**)**

Computing

Department of Information Technology

B.Sc. Cyber Security

**BUK-IFT 212 Computer Architecture and Organization, 2 Unit, Core, 15 LH, 45 PH**

**Senate-approved relevance**

This course is designed in line with the vision and mission of Bayero University Kano to provide high quality instruction to our students, and equip them with the state-of-the-art knowledge and skills in computer science that they need to take up real-world challenges. To conduct cutting-edge research in areas of national need, frequently in collaboration with other disciplines.

**Overview**

Computer Architecture deals with the design of computers, data storage devices, and networking components that store and run programs, transmit data, and drive interactions between computers, across networks, and with users.

**Objectives**

The objectives of the course are to:

1. Discuss the basic concepts and structure of computers.  
2. Describe concepts of register transfer logic and arithmetic operations.  
3. Explain different types of addressing modes and memory organization.  
4. Discuss the different types of serial communication techniques.  
5. Summarize the Instruction execution stages.

**Learning Outcomes**

At the end of this course, students will be able to:

1. Explain the organisation of the classical von Neumann machine and its major functional units;

2. Construct simple assembly language programme segments;

3. Describe how fundamental high-level programming constructs are implemented at the machine-language level;

4. Discuss the concept of control points and the generation of control signals using hardwired or microprogrammed implementations;

5. Describe how the use of memory hierarchy (cache, virtual memory) is used to reduce the effective memory latency; and

6. Explain the concept of interrupts and describe how they are used to implement I/O control and data transfers.

**Course Content**

Principles of computer hardware and instruction set architecture. Internal CPU organisation and implementation. Instruction format and types, memory, and I/O instructions. Dataflow, arithmetic, and flow control instructions, addressing modes, stack operations, and interrupts. Data path and control unit design. RTL, microprogramming and hardwired control. The practice of assembly language programming. Memory hierarchy. Cache memory, Virtual memory. Cache performance. Compiler support for cache performance. I/O organisations.

**Lab work:** Practical demonstration of the architecture of a typical computer. Illustration of different types of instructions and how they are executed. Simple Assembly Language programming. Demonstration of interrupts. Programming assignments to practice MS-DOS batch programming, Assembly Process, Debugging, Procedures, Keyboard input, Video Output, File and Disk I/O, and Data Structure. Demonstration of Reduced Instruction Set Computers. Illustration of parallel architectures and interconnection networks.

**Minimum Academic Standard**

Cyber Security programme’s NUC-MAS requirement facilities.

Bayero University Kano **(**BUK**)**

Computing

Department of Information Technology

B.Sc. Cyber Security

**BUK-MTH 223 Number Theory, 2 Unit, Core, 30 LH**

**Senate-approved relevance**

This course is designed in line with the vision and mission of Bayero University Kano to provide high quality instruction to our students, and equip them with the state-of-the-art knowledge and skills in computer science that they need to take up real-world challenges. To conduct cutting-edge research in areas of national need, frequently in collaboration with other disciplines.

**Overview**

The pureness of Number Theory has captivated mathematicians generation after generation — each contributing to the branch that Carl Gauss described as the “Queen of Mathematics.” Until relatively recent breakthroughs, Number Theory reigned as the king of pure math. Today, however, a basic understanding of Number Theory is an absolutely critical precursor to cutting-edge software engineering, specifically security-based software. Number Theory is at the heart of cryptography — which is itself experiencing a fascinating period of rapid evolution, ranging from the famous RSA algorithm to the wildly-popular blockchain world.

**Objectives**

The objectives of the course are to:

1. Discuss prime numbers and their properties.
2. Use division algorithm and determine divisibility of numbers.
3. Describe modular arithmetic and congruence relations
4. Explain Euclid’s algorithm, greatest common divisor and multiplicative inverses.
5. Describe and apply basic number theorems.

**Learning Outcomes**

The students shall be able to

1. Describe prime numbers.
2. Express the divisibility of numbers and division algorithm.
3. Solve modular arithmetic and congruence relations.
4. Evaluate Euclid’s algorithm, determine greatest common divisor and multiplicative inverses.
5. Determine and apply basic number theorems.

**Course Content**

Primes, divisibility, division algorithm, unique factorization, Greatest common divisor, Modular arithmetic, congruences, Euclid’s algorithm, residue classes, multiplicative inverses, Fermat’s little theorem, Euler’s theorem, Langrange’s theorem.

**Minimum Academic Standard**

Cyber Security programme’s NUC-MAS requirement facilities.

Bayero University Kano **(**BUK**)**

Computing

Department of Information Technology

B.Sc. Cyber Security

**BUK-DTS-301 Data Management I**. **(3 Unit; Core; LH=30, PH=45)**

**Senate-approved relevance**

This course is designed in line with the vision and mission of Bayero University Kano to provide high quality instruction to our students, and equip them with the state-of-the-art knowledge and skills in computer science that they need to take up real-world challenges. To conduct cutting-edge research in areas of national need, frequently in collaboration with other disciplines.

**Overview**

Database Management System (DBMS) course typically covers the principles, design, implementation, and management of databases. The course aims to equip students with the necessary skills and knowledge to design and manage efficient and reliable databases that can store, organize, and retrieve data for various applications.

A database management course typically covers the principles and techniques used to design, implement, and manage a database system. The course may cover both relational and non-relational databases.

**Objectives**

The objectives of the course are to:

1. Provide a solid understanding of the basic concepts and principles of data management. This includes topics such as data modeling, database design, data integration, data warehousing, and data governance.
2. Explore data management tools and technologies: Another important objective of a data management system course is to teach students how to use data management tools and technologies effectively. This includes learning how to use database management systems (DBMS), data integration tools, data warehousing software, and other related technologies.
3. Develop skills in data analysis and reporting: Data management system courses often include a focus on data analysis and reporting. Students learn how to use data analysis tools and techniques to extract meaningful insights from data and how to create reports and visualizations to communicate those insights effectively.
4. Discuss data security and privacy: In today's data-driven world, data security and privacy are critical concerns. A data management system course should cover best practices for securing data and protecting personal information, including topics such as data encryption, access control, and data masking.
5. Describe how to manage data projects: Finally, a data management system course should help students develop skills in project management.

**Learning Outcomes**

Students shall be able to;

1. Describe the components of a database system and give examples of their use.
2. Describe the differences between relational and semi-structured data models.
3. Explain and demonstrate the concepts of entity integrity constraint and referential integrity  
   constraint.
4. Apply queries, query optimizations and functional dependencies in relational databases.
5. Describe database security and integrity issues and their importance in database design.

**Course Content**

Information Management Concepts. Information storage & retrieval. Information management applications. Information capture and representation. Analysis and indexing -search, retrieval, information privacy. Integrity and security. Scalability, Efficiency and Effectiveness. Introduction to database systems. Components of database systems. DBMS  
functions. Database architecture and data independence. Database query language. Conceptual models. Relational data models. Semi-structured data models. Relational theory and languages. Database Design. Database security and integrity. Introduction to query processing and optimisation. Introduction to concurrency and recovery

**Minimum Academic Standard**

Cyber Security programme’s NUC-MAS requirement facilities.

Bayero University Kano **(**BUK**)**

Computing

Department of Information Technology

B.Sc. Cyber Security

**BUK-ICT-305 Data Communication Systems and Network I. (3 Unit; Core; LH=30, PH=45)**

**Senate-approved relevance**

This course is designed in line with the vision and mission of Bayero University Kano to provide high quality instruction to our students, and equip them with the state-of-the-art knowledge and skills in computer science that they need to take up real-world challenges. To conduct cutting-edge research in areas of national need, frequently in collaboration with other disciplines.

**Overview**

Data networking and communication is a course that covers the fundamentals of computer networks, including how data is transmitted and received over networks, as well as the different types of network topologies and protocols used in data communication.

Data communication course is designed to provide students with a fundamental understanding of data communication and networking concepts such as networking architecture, transmission media, and protocol and network management

**Objectives**

The objectives of the course are to:

1. Explain the fundamental concepts of data communication, including how data is transmitted and received, different types of communication channels, and the different types of transmission protocols.
2. Discuss networking technologies such as LAN, WAN, WLAN, VPN, and TCP/IP. Students may learn how these technologies work, their advantages and disadvantages, and how to set them up.
3. Explain the various threats to network security and how to protect networks from these threats. Students may learn about encryption, firewalls, access controls, and other security measures.
4. Explore how to manage networks, install and configure network components, troubleshoot network problems, and perform network maintenance.
5. Apply knowledge to real-world situations to gain hands-on experience with networking technologies and solve networking problems.

**Learning Outcomes**

Students shall be able to:

1. Explain data transmission over layered networks;
2. List and explain common internet technologies and protocols; and
3. Explain network operating system
4. Design and configure networks:
5. Identify network problems, perform tests, analyze results, and take corrective action.

**Course Content**

Types and sources of data. Simple communications network. Transmission definitions, one  
way transmission, half duplex transmission, transmission codes, transmission modes, parallel  
transmission, serial transmission, bit synchronisation, character synchronisation, synchronous and asynchronous transmission. Introduction to network protocol. Seven Layer ISO-OSI standard protocols and  
network architecture. Transport protocols, session services protocols, and other protocols.  
Institute of Electrical and Electronics Engineering 802 standards. Error control and Data  
Compression: Forward Error Control; error detection methods; parity checking; linear block  
codes, cyclic redundancy checking; feedback error control, data compression, Huffman coding.Local Area Networks: medium access control techniques; fibre distributed data interface, and metropolitan area network. Peer-to-peer, Client Server. Client-Server Requirements: GUI design standards, interface and platform independence, transaction processing, backup, and recovery mechanisms. Features and benefits of major recovery  
mechanisms. Network OS: INTERNET: Definition, architecture, services, internet addressing. Internet protocol, IPv4,  
IPv6

**Minimum Academic Standard**

Cyber Security programme’s NUC-MAS requirement facilities.

Bayero University Kano **(**BUK**)**

Computing

Department of Information Technology

B.Sc. Cyber Security

**BUK-CSC-308 Operating Systems. 3 Unit, Core, 30 LH, 45 PH**

**Senate-approved relevance**

This course is designed in line with the vision and mission of Bayero University Kano to provide high quality instruction to our students, and equip them with the state-of-the-art knowledge and skills in computer science that they need to take up real-world challenges. To conduct cutting-edge research in areas of national need, frequently in collaboration with other disciplines.

**Overview**

This course provides a comprehensive understanding of how operating systems work and how they interact with computer hardware and software resources. It is an essential course for computer science students and professionals interested in system software development and design.

**Objectives**

The objectives of the course are to:

1. Discuss the fundamental concepts of operating systems, including its functions, types, history, and evolution.
2. Discuss the concepts of processes and threads, including process management, scheduling, synchronization, and inter process communication.
3. Describe the concepts of memory management, including the allocation, deallocation, and protection of memory resources, virtual memory, paging, and segmentation.
4. Describe the concepts of file systems, including the organization, management, and access of file systems, file types, file attributes, directory structure, and file access methods.
5. Describe the concepts of input/output management, including the management of input/output devices, device drivers, interrupt handling, and buffering.

**Learning Outcomes**

At the end of this course, students should be able to:

1. Recognise operating system types and structures;

2. Describe OS support for processes and threads;

3. Recognise CPU scheduling, synchronisation, and deadlock;

4. Resolve OS issues related to synchronisation and failure for distributed systems;

5. Explain OS support for virtual memory, disk scheduling, I/O, and file systems;

6. Identify security and protection issues in computer systems; and

7. Use C and Unix commands, examine behaviour and performance of Linux, and develop various system programmes under Linux to make use of OS concepts related to process synchronisation, shared memory, mailboxes, file systems, etc.

**Course Content**

Fundamentals of operating systems design and implementation. History and evolution of operating systems. Types of operating systems. Operating system structures. Process management: processes, threads, CPU scheduling, process synchronisation. Memory management and virtual memory. File systems; I/O systems; Security and protection; Distributed systems; Case studies.

**Lab work**: Practical hands-on engagement to facilitate understanding of the material taught in the course. All the process, memory, file and directory management issues will be demonstrated under the LINUX operating system. Also UNIX commands will be briefly discussed. Alternatively, hands-on exposure may be through the use of operating systems developed for teaching, like TempOS, Nachos, Xinu or MiniOS. Another possibility is through programming exercises that implement and simulate algorithms taught. Simulation of CPU scheduling algorithms, producer-consumer problem, memory allocation algorithms, file organisation techniques, deadlock algorithms and disk scheduling algorithms.

**Minimum Academic Standard**

Cyber Security programme’s NUC-MAS requirement facilities.

Bayero University Kano **(**BUK**)**

Computing

Department of Information Technology

B.Sc. Cyber Security

**BUK-CYB-401 Network Security. 3 Unit, Core, 30 LH, 45 PH**

**Senate-approved relevance**

This course is designed in line with the vision and mission of Bayero University Kano to provide high quality instruction to our students, and equip them with the state-of-the-art knowledge and skills in computer science that they need to take up real-world challenges. To conduct cutting-edge research in areas of national need, frequently in collaboration with other disciplines.

**Overview**

A network security course would aim to provide students with a comprehensive understanding of network security, including the tools, technologies, and best practices used to secure networks and protect against security threats.

**Objectives**

The objectives of the course are to:

1. Discuss the principles of network security: Students should have a clear understanding of the basic principles of network security, including the different types of threats, vulnerabilities, and attacks that can compromise network security.
2. Identifying network security risks: Students should be able to identify and assess potential risks to network security, including internal and external threats.
3. Implementing network security measures: Students should be able to implement various security measures to protect networks from unauthorized access, data breaches, and other security threats.
4. Configuring and managing network security devices: Students should have knowledge of how to configure and manage various network security devices, such as firewalls, intrusion detection systems, and virtual private networks (VPNs).
5. Discuss legal and ethical issues in network security: Students should be aware of the legal and ethical issues surrounding network security, including data privacy, intellectual property protection, and cybercrime laws.

**Learning Outcomes**

Students should be able to:

1. Explain the in-depth knowledge of formal techniques for secure computer systems;
2. Have advanced knowledge of common vulnerabilities, attack mechanisms, and methods against computer and information systems;
3. Explain NAT and VLANs configurations, packet filtering, ARP spoofing and session hijacking;
4. Describe the theory and methods underlying access control and information flow policies;
5. Express legal and ethical issues in network security: Students should be aware of the legal and ethical issues surrounding network security, including data privacy, intellectual property protection, and cybercrime laws.

**Course Content**

Introduction to Network Security: This section would provide an overview of network security and introduce the key concepts and principles that form the basis of network security. Security Threats and Vulnerabilities: This section would cover the different types of security threats and vulnerabilities that networks face, including malware, hacking, denial of service attacks, and social engineering. Network Security Tools and Technologies: This section would introduce students to the various tools and technologies used to secure networks, including firewalls, intrusion detection and prevention systems, VPNs, and encryption. Network Security Protocols: This section would cover the different network security protocols, including SSL/TLS, IPSec, and SSH, and explain how they are used to secure network communications. Access Control and Authentication: This section would cover access control and authentication mechanisms, including user authentication, role-based access control, and multi-factor authentication. Network Security Management: This section would cover network security management, including risk assessment, security policy development, and incident response planning.

Legal and Ethical Issues in Network Security: This section would cover the legal and ethical issues related to network security, including privacy, data protection, and intellectual property.

**Minimum Academic Standard**

Cyber Security programme’s NUC-MAS requirement facilities.

Bayero University Kano **(**BUK**)**

Computing

Department of Information Technology

B.Sc. Cyber Security

**BUK-CYB-402 Malware Analysis. 3 Unit, Core, 30 LH, 45 PH**

**Senate-approved relevance**

This course is designed in line with the vision and mission of Bayero University Kano to provide high quality instruction to our students, and equip them with the state-of-the-art knowledge and skills in computer science that they need to take up real-world challenges. To conduct cutting-edge research in areas of national need, frequently in collaboration with other **Overview**

Malware analysis is the process of extracting information from malware through static and dynamic inspection by using different tools, techniques, and processes. It is a methodical approach to uncovering a malware’s main directive by extracting as much data from malware as possible while it is at rest and in motion.

**Objectives**

The objectives of the course are to:

1. Discuss the concept of Malware Analysis and Reverse Engineering
2. Explain the process of Malware Analysis
3. State and explain the Malware Taxonomy
4. Describe how to set up a Malware Research Lab Environments
5. Demonstrate the ways of inspecting Malwares using the Malware Analyst toolbox

**Learning Outcomes**

At the end of the course, students should be able to:

1. Provide the conceptual understanding of Malware Analysis and Reverse Engineering;
2. Define the different classification of malware and processes of malware analysis,
3. Describe the two states of malware: static and dynamic
4. Identify the environments needed to inspect the malware,
5. Illustrate how to collect and properly handle malware samples from different sources

**Course Content**

Malware Analysis and Reverse Engineering, Types, Purpose, Limitation and Process of Malware Analysis, The Effective Malware Analys. Malware Taxonomy: Malware Classes, Malware Deployment, Infection Vectors, Types of Infection Vectors, Potential Infection Vectors. The Two States of Malware: Static and Dynamic, Protective Mechanisms, Malware Dependencies. Malware Research lab: Malware Collection, Your own Backyard, Free Sources, Research Mailing Lists, Sample Exchange, Commercial Sources, Honeypots, Setting up Static and Dynamic Labs. Malware Inspection, The Portable Executable File, Proper Way to Handle Files, Inspecting Static and Dynamic Files, Tools of the Trade.

**Minimum Academic Standard**

Cyber Security programme’s NUC-MAS requirement facilities.

Bayero University Kano **(**BUK**)**

Computing

Department of Information Technology

B.Sc. Cyber Security

**BUK-IFT-434 Blockchain Technology and Application. 3 Unit, Core, 30 LH, 45 PH**

**Senate-approved relevance**

This course is designed in line with the vision and mission of Bayero University Kano to provide high quality instruction to our students, and equip them with the state-of-the-art knowledge and skills in computer science that they need to take up real-world challenges. To conduct cutting-edge research in areas of national need, frequently in collaboration with other disciplines.

**Overview**

This course aims to provide a conceptual understanding on the function of Blockchains as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable. It covers the technological underpinnings of blockchainoperations as distributed data structures and decision-making systems, their functionality, and different architecture types. It provides a critical evaluation of existing Smart Contract (SM) capabilities and platforms, and examines their future directions, opportunities, risks and challenges.

**Objectives**

The objectives of the course are to:

1. Provide a conceptual understanding on the function of Blockchains as a method of securing distributed ledgers
2. Describe the technological underpinnings of blockchain operations as distributed data structures and decision-making systems, their functionality, and different architecture types.
3. Describe the critical evaluation of existing Smart Contract (SM) capabilities and platforms,
4. Examinee the future directions, opportunities, risks and challenges of existing Smart Contract (SM).

**Learning Outcomes**

Students will be able to:

1. Explain the structure of a Blockchain and why/when it is better than a simple distributed database.
2. Analyze the incentive structure in a blockchain based system and critically assess its functions, benefits and vulnerabilities.
3. Evaluate the setting where a blockchain based structure may be applied, its potential and its limitations.
4. Discuss what constitutes a "smart" contract, what are its legal implications and what it can and cannot do, now and in the near future.
5. Analyze to what extent smart and self-executing contracts can benefit automation, governance, transparency and the Internet of Things (IoT).
6. Explain of the new challenges that exist in monetizing businesses around blockchains and smart contracts;

**Course Content**

An (Deeper) Overview of Bitcoin, Alternative coins and Networks. Methods of Blockchain Security. Public, Syndicated and Hybrid Blockchains. Securing, Interconnecting Public and Private Blockchains. Smart Contracts: Overview of Algorithmic Decision Making. Smart Contracts: Distributed Autonomous Organizations. Smart Contracts: Connecting external data and physical resources (Oracles, and IoT). Machine driven and Socially driven Oracles, syndication and their respective issues. Reality Keys, Truthcoin (Bitcoin Hivemind), Orisi, Town Crier, ChainLink, as oracles. The rising importance of decentralized reputation mechanisms and sources of new "clout". Contract Autonomy, Transparency and Monetization. Use Cases: Augur, Gnosis and reputation as a tradable commodity basis for a social oracle system. Use Cases: Blockchain-based IoT functionalities and challenges, use-cases: Slock.it and Oraclize. Use Cases: Open Bazaar and other platforms as decentralized information and reputation (super) marketplaces, reputation brokerages and smart darknet marketplaces (Daemon). Use Cases: Additional functions of decentralized markets beyond mere products.

**Minimum Academic Standard**

Cyber Security programme’s NUC-MAS requirement facilities.

Bayero University Kano **(**BUK**)**

Computing

Department of Information Technology

B.Sc. Cyber Security

**BUK-SEN 403 Open Source Software Development and** **Applications (2 Unit; Elective; LH=15, PH=45)**

**Senate-approved relevance**

This course is designed in line with the vision and mission of Bayero University Kano to provide high quality instruction to our students, and equip them with the state-of-the-art knowledge and skills in computer science that they need to take up real-world challenges. To conduct cutting-edge research in areas of national need, frequently in collaboration with other disciplines.

**Overview**

Open source software development course is designed to teach creating software that allows anyone to view, modify, and distribute the source code. It is a popular approach for creating high-quality software that is free and openly available to everyone.

The course is designed to teach how to develop software using open source tools and technologies. The goal of open source development is to create high-quality innovative software that is freely available to everyone.

**Objectives**

The objectives of the course are to:

1. Explain the principles of open source software development and its importance in the industry.
2. Acquire the skills and knowledge necessary to contribute to open source software projects.
3. Discuss how to use tools and platforms commonly used in open source software development, such as Git and GitHub.
4. Explore the different types of open source licenses and their implications on software development.
5. Create real-world open source software project.

**Learning Outcomes**

Students shall be able to;

1. Develop a thorough understanding of the principles of open source software development, including its history and benefits.
2. Acquire practical skills in using open source software development tools, such as version control systems and bug trackers.
3. Explain the importance of communication and collaboration within the open source community, including how to interact with other developers and contribute effectively to open source projects.
4. Explain the implications of different types of open source licenses on software development, including how to choose a license and how to comply with license requirements.
5. Develop a strong sense of responsibility and commitment to contributing to the open source community, including how to create and maintain high-quality open source software.

**Course Content**

Introduction to open source software development: what open source software development is and why it is important.Open source licensing: different types of open source licenses and their implications. Tools and technologies: This will cover the various tools and technologies used in open source development such as version control systems, issue trackers, and collaborative platforms.Building and contributing to open source projects: how to find and contribute to existing open source projects as well as how to start your own. Best practices for open source development: code reviews, testing, documentation, and communication. Community management: how to manage an open source community and how to handle conflicts that may arise.Open source business models: business models that can be used for open source software development such as support and services, dual licensing, and open core.

**Minimum Academic Standard**

Cyber Security programme’s NUC-MAS requirement facilities.