**Bayero University, Kano**

**Faculty of Computing**

**Department of Information Technology**

**BSc Information Technology**

**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 | 30 | 45 |
| BUK-ICT 102 | Introduction to Information and Communication Technology | 2 | C | 30 | - |
| BUK-COS 103 | Introduction to Computer Programming | 3 | C | 30 | 45 |
|  | **Total** | **7** |  |  |  |

**Level 200**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title** | **Unit** | **Status** | **LH** | **PH** |
| BUK-IFT 220 | Net-Centric Computing | 2 | C | 15 | 45 |
| BUK-INS 202 | Human-Computer Interactions | 2 | C | 15 | 45 |
| BUK-INS 204 | System Analysis and Design | **3** | C | 30 | 45 |
|  | **Total** | **7** |  |  |  |

**Level 300**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title** | **Unit** | **Status** | **LH** | **PH** |
| BUK-IFT 303 | System Testing, Integration and Quality Assurance | 2 | C | 15 | 45 |
| BUK-DTS 304 | Data Management I | 2 | C | 30 | 45 |
| BUK-DTS 302 | Big Data Computing | 2 | C | 15 | 45 |
| BUK-COS 301 | Soft Skills in Computing | 2 | C | 15 | 0 |
| BUK-SEN 301 | Object-Oriented Programming | 2 | C | 15 | 45 |
|  | **Total** | **10** |  |  |  |

**Level 400**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title** | **Unit** | **Status** | **LH** | **PH** |
| BUK- CSC 406 | Artificial Intelligence | 2 | C | 15 | 45 |
| BUK-IFT 334 | Blockchain Technology and Application | 3 | C | 30 | 45 |
| BUK-IFT 430 | Cloud Computing | 3 | C | 30 | 45 |
| BUK-DTS 403 | Network Security | 2 | C | 15 | 45 |
| BUK-DTS 403 | Data Visualisation for Data-driven Decision Making | 2 | C | 15 | 45 |
| BUK-IFT 405 | Open Source Software Development and Applications | 2 | C | 15 | 45 |
| BUK-IMT 408 | Operation Research | 2 | E | 15 | 45 |
| BUK-IFT 421 | Emerging Trends in IT | 2 | E | 15 | 45 |
|  | **Total** | **20** |  |  |  |
| **Grand Total** | | **34** |  |  |  |

**Bayero University, Kano**

**Faculty of Computing**

**Department of Information Technology**

**B.Sc. Information Technology**

# 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. Explore 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. Explain 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 contentss**

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**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.

**Bayero University, Kano**

**Faculty of Computing**

**Department of Information Technology**

**B.Sc. Information Technology**

# 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 contents**

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**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.

**Bayero University, Kano**

**Faculty of Computing**

**Department of Information Technology**

**B.Sc. Information Technology**

# BUK-COS-103 Introduction to computer programming. 3 Unit, Core, LH=30, PH=45

**Senate approved relevance to mission and strategic goals of the university**

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 contents**

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**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.

**Bayero University, Kano**

**Faculty of Computing**

**Department of Information Technology**

**B.Sc. Information Technology**

# BUK-IFT 220 Net-Centric Computing. 2 Unit, Core, LH=15, PH=45

**Senate approved relevance to mission and strategic goals of the university**

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**.**

**Course Overview**

Computer networking has become one of the significant developments in technology that has facilitated the connection of people from across the world. This is possible with the largest public network the Internet. Internet has enabled people access data and information from anywhere, anytime, and anyhow. This course highlights the structure of the Internet and the basics of computer networking so that students can design networks on their own. Recent development in computing and telecommunication has suggested the increase of mobile Internet access compared to fixed Internet access and this trend is expected to increase with the advancement of Internet of Things (IoT) technologies. Hence the need to understand what mobile networking technologies are and be ready to leverage their potential in network designs. The network security is also covered so that the networks design is protected from attacks by the intruders.

**The objectives of the course are to:**

1. Equip students with the principles of data communications and network;

2. Demonstrate skills in different networking options;

3. Design a networked system given the requirements;

4. Demonstrate skills in Mobile and wireless Technologies;

5. Advance Technologies for Wireless Communication;

6. Outline security principles to secure data in transit.

**Learning Outcome:**

On completion of the course, students should be able to:

1. Discuss the principles of data communications and network;

2. Explain the different networking options;

3. Draw a networked system given the requirements;

4. Understand Mobile and wireless Technologies;

5. List different networking technologies;

6. Explain security principles to secure data in transit.

**Course contents**

Computer Network and Internet, Application Layer, Transport Layer, Network Layer: Data Plane, Network Layer: Control Plane, Link Layers and LAN, Mobile & Wireless Network, Technologies for Wireless Communication, Wireless Cellular System, Overview of Wireless LAN, IEEE 802.11, Personal Area Network, High Speed Wireless Network: HiperLAN, Security in Mobile Networks, Client/Server Computing (using the web), Building Web Applications.

**Minimum Academic Standard**

Networking Laboratory with Standard NUC-CCMAS required facilities.

**Bayero University, Kano**

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# BUK- INS 202 Human-Computer Interactions 2 Unit, Elective, 15 LH, 45 PH

**Senate approved relevance to mission and strategic goals of the university**

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**

Human-Computer Interaction (HCI) is a field that explores the design, development, and evaluation of interactive computer systems for human use. The course provides an overview of HCI concepts, principles, and techniques that enable the design and development of effective interactive systems.

The course covers the basics of human perception, cognition, and behavior, as well as the ways in which people interact with computer systems. Students will learn about the principles of usability, user-centered design, and user experience design, and the role of feedback, interactivity, and feedback in designing effective interactive systems.

The course also covers a range of design and evaluation methods, such as user research, prototyping, and usability testing. Students will learn how to identify user needs, design interfaces that meet those needs, and evaluate the usability and effectiveness of interactive systems.

Finally, the course explores emerging trends in HCI, such as mobile computing, social computing, and ubiquitous computing. Students will learn how to design and develop interactive systems that are adapted to different contexts and platforms, and how to evaluate the effectiveness of such systems.

By the end of the course, students should have a solid understanding of the fundamental concepts of HCI, and be able to apply these concepts to the design and development of effective interactive systems. Students will also gain hands-on experience in designing, prototyping, and evaluating interactive systems, and be prepared for further study or careers in HCI, design, or user experience.

**Objectives**

1. Understand the fundamentals of human-computer interaction (HCI) and its importance in design.
2. Develop skills in analyzing, designing, and evaluating user interfaces for digital systems and gain knowledge of various design principles, guidelines, and best practices for creating effective user interfaces.
3. Learn different approaches to user research and testing to gather user feedback and improve design, emerging technologies and their impact on HCI, such as virtual and augmented reality, conversational interfaces, and machine learning.
4. Develop critical thinking skills to evaluate the ethical and social implications of technology design and use.
5. Explore and analyze case studies and real-world examples of successful and unsuccessful HCI design.

**Learning Outcomes**

1. discuss the foundations and concept of the human-computer interface;
2. explain Understanding of principles of human-computer interface;
3. explain the design and development of the human-computer interface; and
4. explain the importance of user feedback.

**Course contents**

Foundations of HCI. The concept underlying the design of HCI. Principles of GUI. GUI toolkits. System design methods. User conceptual models and interface metaphors. Human cognitive and physical ergonomics. Human-centred software evaluation and development. GUI design and programming.

**Minimum Academic standards requirements**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.

**Bayero University, Kano**

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# BUK- INS 204 System Analysis and Design (2 Unit, Elective, 15 LH, 45 PH)

**Senate approved relevance to mission and strategic goals of the university**

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 System Analysis and Design course teaches students how to analyze, design, and develop information systems. The course covers a range of concepts, methodologies, and tools used in the system development life cycle, including gathering and analyzing requirements, designing the system architecture and user interface, implementing the system, and testing and maintaining it.

Throughout the course, students will learn about different frameworks and methodologies used in system analysis and design, as well as programming languages, software development methodologies, and tools used to implement and test the system.

The course is designed to provide students with a strong foundation in the process of designing and developing information systems, as well as the skills and knowledge necessary to apply this process to real-world projects. Upon completion of the course, students should be able to understand and apply the system development life cycle, develop comprehensive system requirements, create an appropriate system design based on those requirements, implement and test the system, and maintain and improve it over time.

Overall, the System Analysis and Design course is an essential course for students interested in pursuing careers in software development, information technology, or systems analysis, as it provides the skills and knowledge necessary to design and develop effective information systems that meet business goals.

**Objectives**

1. To understand the basic concepts and principles of systems thinking and system analysis, and how they can be applied to the development of information systems.
2. To learn how to gather, document, and analyze requirements for a system, and how to translate those requirements into specific system functionality.
3. To learn how to implement and test a system, and how to maintain and improve it over time.
4. To become familiar with different methodologies and frameworks used in system analysis and design, including the Waterfall Model, Agile Methodology, and Rational Unified Process (RUP).
5. To develop critical thinking and problem-solving skills necessary to identify and resolve issues that may arise during the system development process.

**Learning Outcomes**

1. describe system requirements gathering techniques;
2. explain data modelling technique (entity relationship modelling);
3. explain process modelling technique (data flow diagram);
4. describe system architectural design;
5. describe process and database design; and
6. explain user interface design.

**Course contents**

Structured approach to analysis and design of information systems for businesses. Software development life cycle. Structured top-down and bottom-up design. Dataflow diagramming. Entity relationship modelling. Computer aided software engineering. Input and output, prototyping design and validation. File and database design. Design of user interfaces. Comparison of structured and object-oriented design.

Lab work:

Practical exercises on software development life cycle (SDLC) activities with different case studies. Use of different information systems case studies to apply the knowledge of structured top-down and bottom –up design, dataflow diagram and entity relationship models.

**Minimum Academic standards requirements**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.

**Bayero University, Kano**

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# BUK-IFT 303 System Testing, Integration and Quality Assurance (3 Units; Core; LH = 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**

The System testing, integration and quality assurance course teaches students how to analyze, design, and develop information systems. The course covers a range of concepts, methodologies, and tools used in the system development life cycle, including gathering and analyzing requirements, designing the system architecture and user interface, implementing the system, and testing and maintaining it.

Throughout the course, students will learn about different frameworks and methodologies used in system analysis and design, as well as programming languages, software development methodologies, and tools used to implement and test the system

**Objectives**

1. state the critical importance of software testing in ensuring software quality;
2. explain the difference between validation and verification and their different techniques;
3. describe the concept of quality assurance and differentiate between process assurance and product assurance;
4. describe the different statistical approaches to quality control.

**Learning Outcomes**

The students will be able to

1. state the critical importance of software testing in ensuring software quality;
2. explain the difference between validation and verification and their different techniques;
3. describe the concept of quality assurance and differentiate between process assurance and product assurance;
4. describe the different statistical approaches to quality control.

**Course contents**

The importance of Software Testing. Understanding Verification and Validation. How to assure it and verify it, and the need for a culture of quality. Avoidance of errors and other quality problems. Inspections and reviews. Testing, verification and validation techniques. Process assurance vs. Product assurance. Quality process standards. Product and process assurance. Problem analysis and reporting. Statistical approaches to quality control. Debugging tools; unit testing – black box and white testing techniques; integration and system testing tools; other testing tools. performance testing, load testing, stress testing, regression testing, security testing; manual testing vs automated testing.

**Minimum Academic Standards**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.

**Bayero University, Kano**

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# BUK-DTS-301 Data Management I (3 Units; Core; LH = 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.

**Objectives**

1. Understand the concepts and principles of data management: One of the primary objectives of a data management system course is to 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. Learn how to use 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. Understand 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. Learn how to manage data projects.

**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 optimisations and functional dependencies in relational databases.
5. Describe database security and integrity issues and their importance in database design.

**Course contents**

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 Standards**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.

**Bayero University, Kano**

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# BUK-DTS-302 Big Data Computing (3 Units; Core; LH = 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**

The Big Data Computing course is designed to teach students about the challenges and opportunities presented by the processing and analysis of large-scale data sets, also known as big data. The course covers a range of topics related to big data, including data storage, distributed computing, data management, and analysis. Throughout the course, students will gain an understanding of the technologies and tools used in big data computing, such as Hadoop, MapReduce, and Spark. They will also learn about data management techniques for big data, including data warehousing and data lakes, and the importance of data quality and integrity in big data systems. The course will also cover data analysis techniques for big data, such as machine learning, data mining, and predictive analytics. Students will learn how to use these techniques to extract insights and knowledge from large-scale data sets.

To provide students with hands-on experience, the course includes assignments and projects that involve working with real-world big data sets and using big data technologies and tools to process and analyze the data. By completing these assignments and projects, students will gain practical experience and build a portfolio of big data projects that they can showcase to potential employers. The course is designed to prepare students for careers in big data computing or related fields by providing them with the skills and knowledge necessary to manage, process, and analyze large-scale data sets.

**Objectives**

1. To introduce students to the concepts and challenges of big data computing, including data storage, distributed computing, and data management.
2. To provide students with an understanding of data management techniques for big data, including data warehousing and data lakes, and the importance of data quality and integrity in big data systems.
3. To teach students about data analysis techniques for big data, such as machine learning, data mining, and predictive analytics.
4. To provide students with hands-on experience in processing and analyzing large-scale data sets using big data technologies and tools.
5. To prepare students for careers in big data computing or related fields by providing them with the skills and knowledge necessary to manage, process, and analyze large-scale data sets.

**Learning Outcomes**

Students will be able to;

1. identify Big Data;
2. identify some of the foundational tools, systems, and platforms that feature in working with Big Data across several domains;
3. install Big Data working tools on a computer; and Analyse Big Data contents.

**Course contents**

Installation: Cloudera VM, Jupyter server. Big data retrieval and relational querying: Postgres databases, NoSQL data, MongoDB, Aerospike, and Pandas for data aggregation and working with data frames. Big Data Integration: Splunk and Datameer. Big Data Processing: Apache Spark, Hadoop, Spark Core (Spark MLlib and GraphX). Big Data Applications (Graph Processing). Big Data Streaming Platforms for Fast Data.

**Minimum Academic Standards**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.

**Bayero University, Kano**

**Faculty of Computing**

**Department of Information Technology**

**B.Sc. Information Technology**

# BUK- CSC 309 Blockchain Technology and Application (3 Units; Core; LH = 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 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 blockchain operations 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**

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 contents**

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 Standards**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.

**Bayero University, Kano**

**Faculty of Computing**

**Department of Information Technology**

**B.Sc. Information Technology**

# BUK-IFT-430 Cloud Computing and Security (3 Units; Core; LH = 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**

Cloud Computing is a technology that allows you to use the resources of a large number of computers connected through a real-time communication network. By using cloud computing, you can gain access at any time through any device, via the Internet, to data and files which you have uploaded, or to software applications which you need to use for personal or professional use. Cloud computing being used more and more in business today and it is very important for any professional to understand what it is all about. This course defines Cloud Computing and establishes a strong working knowledge of the concepts and technologies needed to work effectively with the cloud. The course allows you to understand what cloud computing is and how it works. It describes the benefits of cloud computing along with its potential drawbacks. The course enables you to determine which cloud is appropriate from a business and technical perspective, to select appropriate cloud providers and to plan and implement a cloud adoption strategy. Formation of theoretical knowledge and practical skills in practical realization of the benefits of cloud computing in today's business, learning the tools of the technology. The course covers technologies required to build classic (traditional), virtualized, and cloud data center environments. These technologies include compute, storage, networking, desktop and application virtualization.

**Objectives**

1. introduction to the basic concepts and terminology of cloud computing;
2. familiarization with areas of cloud technologies;
3. acquaintance with the concept of cloud computing in relation to business activities;
4. Security Studies, scaling, deployment, backup, in the context of cloud infrastructure; llearning techniques cloud programming;
5. development of system administration skills for the develop

**Learning Outcomes**

Students shall be able to;

1. articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing
2. identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
3. explain the core issues of cloud computing such as security, privacy, and interoperability.
4. choose the appropriate technologies, algorithms, and approaches for the related issues.
5. identify problems, and explain, analyze, and evaluate various cloud computing solutions.

**Course contents**

Introduction to cloud computing. Objectives, challenges, application domains, advantages. Computational and storage cloud architectures; Service level agreements, service lifecycle management. Elasticity and scalability techniques; Information, account and billing management. Cloud service model, service provisioning and access models. Cloud Service Models: Software as a Service layer; Platform as a Service layer; Infrastructure as a Service layer. Virtualization and resource management. Distributed object storage clouds. Data storage and retrieval based on content. Computational tasks execution in storage clouds. Quality of service approaches. Requirements and parameters classification. Monitoring and control mechanisms. Quality of service guarantees. Security in the Cloud: Cloud threats; Threat Mitigation, Cloud and Security Risks: Google AppEngine, OpenStack, Apache Hadoop / MapReduce.

**Minimum Academic Standards**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.

**Bayero University, Kano**

**Faculty of Computing**

**Department of Information Technology**

**B.Sc. Information Technology**

# BUK-DTS 403 Data Visualisation for Data-driven Decision Making (3 Units; Core; LH = 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**

The "Data Visualisation for Data-driven Decision Making" course is designed to help students develop the skills and knowledge needed to effectively use data visualisation to support decision-making processes. In this course, students will learn how to design and create effective visualisations that communicate insights from data in a clear and compelling way. Throughout the course, students will gain familiarity with various data visualisation tools and software, such as Tableau and Excel. They will also learn different techniques for visualising different types of data, such as time series, categorical, and quantitative data. In addition to learning how to create visualisations, students will also develop critical thinking skills to evaluate the quality and effectiveness of data visualisations.

They will learn how to interpret and communicate the insights derived from data visualisation effectively, and understand best practices for designing and presenting data visualisations. The course will also cover principles of data-driven decision-making and how data visualisation can help in this process. Students will learn how to use data visualisation to tell compelling stories and make persuasive arguments, and will gain an understanding of ethical and privacy considerations when working with data visualisations. The course will provide students with a comprehensive understanding of the role that data visualisation plays in decision-making processes and equip them with the skills needed to effectively create and communicate insights from data visualisations.

**Objectives**

1. Understand the importance of data visualisation in decision-making processes
2. Develop skills in designing and creating effective visualisations to communicate insights from data
3. Learn different techniques for visualising different types of data, such as time series, categorical and quantitative data
4. Learn how to use data visualisation to tell compelling stories and make persuasive arguments
5. Develop an understanding of ethical and privacy considerations when working with data visualisations.

**Learning Outcomes**

1. utilise techniques that are applied in preparing and producing data into a form that meets the needs of particular and varied audiences; and
2. develop logical, meaningful skills that bothers not just on the relevance of the data that informed the particular outcomes, but also on the real-world implications of how these outcomes are factored into decision-making processes.

**Course contents**

Various methods for presenting data for visualisation as well as how to choose between them. Fundamentals of data presentation using tables, graphs, images and video animations. Create engaging visualisations using graphs, images and video animations. Data summaries, working with tables, presenting data through graphs and plots, presenting data through video animation, creating interactive/augmented visualisation of data (ability to zoom into sections). Practical experiments on different methods of presenting data for visualization. Practice on how to use graphs, tables, images, and video on animation for data presentation.

**Minimum Academic Standards**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.

**Bayero University, Kano**

**Faculty of Computing**

**Department of Information Technology**

**B.Sc. Information Technology**

# BUK-CSC 406 Artificial Intelligence (2 Unit; Core; LH=15)

**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**

Artificial intelligence course is designed to introduce students to the field of AI including its history, application and techniques. The course is typically designed to provide students with a comprehensive understanding of the principles and techniques used in AI as well as their application in various domains. The course covers a range of topics related to machine learning, natural language processing and computer vision.

In this course, students will learn about the fundamentals of AI, its various applications, and the techniques used to develop intelligence. Throughout the course students will work on projects related to AI using software tools such python

**Objectives**

The objectives of the course are to:

1. Provide an understanding of the basic concepts and principles of AI, including machine learning, neural networks, natural language processing, and robotics.
2. Introduce students to the various tools and techniques used in AI development, such as Python, TensorFlow, and PyTorch.
3. Enable students to apply AI techniques to real-world problems and develop AI systems that can learn from data and make predictions.
4. Familiarize students with the ethical and societal implications of AI, including issues related to privacy, bias, and fairness.
5. Prepare students for careers in AI research, development, and implementation and to provide a foundation for further study in specialized areas of AI, such as computer vision, speech recognition, and autonomous systems.

**Learning Outcomes**

Students shall be able to:

1. explain AI fundamentals, concepts, goals, types, techniques, branches, applications, AI  
    technology and tools;
2. discuss intelligent agents, their performance, examples, faculties, environment and  
    architectures, and determine the characteristics of a given problem that an intelligent  
    system must solve;
3. differentiate between the concepts of optimal reasoning/behaviour and human-like  
    reasoning/behaviour;
4. describe the role of heuristics and the trade-offs among completeness, optimality, time  
    complexity, and space complexity;
5. analyse the types of search and their applications in AI and describe the problem of  
    combinatorial explosion of search space and its consequences.

**Course contents**

Introduction to Artificial Intelligence: overview of what AI is, its history, and the various types of AI. Problem Solving using AI: various AI techniques to solve problems such as search algorithms, optimization algorithms, and constraint satisfaction. Machine Learning: basic concepts of machine learning, including supervised and unsupervised learning, decision trees, and neural networks. Natural Language Processing: parsing, semantic analysis, and sentiment analysis. Computer Vision: basics of computer vision, including image processing, feature extraction, and object recognition.Robotics: basics of robotics, including kinematics, control systems, and sensors. Ethics and Future of AI: discuss the ethical considerations around AI and its impact on society.

**Minimum Academic Standard**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.

**Bayero University, Kano**

**Faculty of Computing**

**Department of Information Technology**

**B.Sc. Information Technology**

# BUK-CYB 407 Cloud Computing and Security (2 Unit; Core; LH=15, PH=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**

Cloud Computing is a technology that allows you to use the resources of a large number of computers connected through a real-time communication network. This course defines Cloud Computing and establishes a strong working knowledge of the concepts and technologies needed to work effectively with the cloud. The course allows students to understand what cloud computing is and how it works. It describes the benefits of cloud computing along with its potential drawbacks.

The course covers technologies required to build classic (traditional), virtualized, and cloud data center environments. These technologies include compute, storage, networking, desktop and application virtualization.

**Objectives**

The objectives of the course are to:

1. Explain the basic concepts and terminology of cloud computing;
2. Explore areas of cloud technologies;
3. Discuss with the concept of cloud computing in relation to business activities;
4. Discuss security Studies, scaling, deployment, backup, in the context of cloud infrastructure;
5. Develop skills and techniques in cloud programming;

**Learning Outcomes**

Students shall be able to;

1. Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing
2. Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
3. Explain the core issues of cloud computing such as security, privacy, and interoperability.
4. Choose the appropriate technologies, algorithms, and approaches for the related issues.
5. Identify problems, and explain, analyze, and evaluate various cloud computing solutions.

**Content**

Introduction to cloud computing. Objectives, challenges, application domains, advantages. Computational and storage cloud architectures; Service level agreements, service lifecycle management. Elasticity and scalability techniques; Information, account and billing management. Cloud service model, service provisioning and access models. Cloud Service Models: Software as a Service layer; Platform as a Service layer; Infrastructure as a Service layer. Virtualization and resource management. Distributed object storage clouds. Data storage and retrieval based on content. Computational tasks execution in storage clouds. Quality of service approaches; Requirements and parameters classification, Monitoring and control mechanisms, Quality of service guarantees Security in the Cloud: Cloud threats; Threat Mitigation, Cloud and Security Risk.

**Minimum Academic Standard**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.

**Bayero University, Kano**

**Faculty of Computing**

**Department of Information Technology**

**B.Sc. Information Technology**

# BUK-SEN 403 Open Source Software Development and Applications (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**

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 contents**

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**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.

**Bayero University, Kano**

**Faculty of Computing**

**Department of Information Technology**

**B.Sc. Information Technology**

# BUK-IMT 408 Operation Research (2 Unit; Core; LH=15, PH=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**

Operation research course is designed to introduce students to mathematical and quantitative methods used to optimize complex systems and make informed decisions. This course provides an introduction to Operations Research, a field of study that uses mathematical and analytical methods to help organizations make better decisions.

The course covers a range of topics, including linear programming, network analysis, queuing theory, decision analysis, and simulation modeling. Emphasis is placed on the use of modeling techniques and optimization software to solve practical problems.

**Objectives**

The objectives of the course are to:

1. Develop a solid understanding of the fundamental principles and concepts of Operations Research.
2. Develop proficiency in formulating and solving linear programming problems, including optimization of resource allocation, production planning, and transportation problems.
3. Explain network analysis techniques for solving problems such as shortest path, maximum flow, and project scheduling.
4. Discuss Gain the role of Operations Research in a wide range of industries, including manufacturing, transportation, healthcare, and finance.
5. Explore the ethical considerations involved in Operations Research and its impact on society

**Learning Outcomes**

Students shall be able to;

1. Model complex systems using mathematical and quantitative methods.
2. Identify and explain commonly used OR techniques including modeling and decision analysis
3. Create their own formulations and expand existing formulations
4. Critically evaluate the impact of model assumptions
5. Choose an appropriate solution technique for a given formulation.

**Course contents**

Introduction to Operation Research: overview of OR, its applications, and its history.Linear Programming: formulation and solution of linear programming problems, graphical solution methods, simplex method, duality theory, sensitivity analysis, and transportation problems. Network Analysis: critical path method (CPM) and the program evaluation and review technique (PERT), which are used to analyze complex projects and identify the critical path. Integer Programming: formulation and solution of integer programming problems, branch and bound algorithm, and cutting plane methods. Nonlinear Programming: gradient-based methods, Newton's method, and constrained optimization. Game Theory: zero-sum games, non-zero-sum games, and cooperative games. Decision Analysis. Network error

**Minimum Academic Standard**

B.Sc. Information Technology programme’s NUC-MAS requirement facilities.