STUDENTS HANDBOOK
B.SC DATA SCIENCE
2023

Table of Contents

Foreword

Welcome to a world of endless possibilities at West Midlands Open University, where dreams become realities. We are Nigeria's pioneering private open university, with a clear purpose to prepare people for opportunities and to improve society through education. We are a vibrant academic community that believes in the power of education to transform lives and cultivate a brighter future. We are digital, and we use appropriate technologies to drive our operations and processes. We are committed to your personal growth and nurturing your potential to become a positive agent of change in the world.

Our university is deeply rooted in the principal values of empathy, truthfulness, and innovation. These values guide our actions, shape our culture, and drive us to create a better society using the programmes in our various schools. We encourage you to imbibe these values as you study at West Midlands, use the computing, managerial, social, and soft skills you would gain in any of our departments to make the world a better place.

This handbook is a comprehensive guide that will serve as your compass throughout your journey with us. It contains all the course information you will need in your department and provides an all-inclusive course description, learning outcomes, mode of assessment, grading system, rules, and regulations for all the courses you will study. Please consult the handbook for all your academic decisions. It is a valuable resource that will help you succeed in your studies. If you have any questions or concerns, please do not hesitate to reach out to your Head of Department and the Student Success Advisors. They would be happy to assist you. We are here to support you all the way.

As an open university, we are committed to academic excellence, an excellent student experience, accessibility, inclusivity, affordability, flexibility, and a strong partnership in education. We require you to pursue your studies with dedication and stay true to these commitments. Remember that quality is our watchword, and your success as an outstanding graduate is our priority.

Congratulations!

Professor Olumide Babatope Longe

Vice Chancellor

Vision of the University

Become the most trusted tertiary education institution through world-class digital learning services and the efficacy of outcomes.

Mission Statement

To offer access to a wide range of flexible, affordable, and qualitative academic programmes that empower individuals with the skills they need to thrive in today's world.

Philosophy of the University

Our philosophy at West Midlands Open University is based on:

Diversity: West Midlands Open University is committed to creating a diverse and inclusive community where everyone feels welcome and respected. We believe that diversity is essential for innovation and excellence. We value the unique perspectives and experiences of our students, faculty, and staff. We are committed to creating a culture where everyone feels comfortable sharing their ideas and participating in the learning process.

Cultural awareness and respect: We believe that cultural awareness and respect are essential for a successful learning environment. We encourage our students, faculty, and staff to learn about and appreciate different cultures. We strive to create a culture where everyone feels safe and respected, regardless of their cultural background.

High standard professional behavior: We expect our students, faculty, and staff to uphold the highest standards of professional behavior. This means being respectful of others, being honest and ethical, and being committed to excellence. We believe that high standards of professional behavior are essential for creating a positive learning environment and for preparing students for success in the workplace.

Intellectual curiosity and pursuit of knowledge: West Midlands Open University is committed to fostering intellectual curiosity and the pursuit of knowledge. We encourage our students, faculty, and staff to ask questions, to challenge the status quo, and to

explore new ideas. We believe that intellectual curiosity and the pursuit of knowledge are essential for innovation and for solving the challenges of the 21st century.

Discipline: We believe that discipline is essential for a successful learning environment. We expect our students, faculty, and staff to be disciplined in their work and studies. This means being punctual, being prepared, and meeting deadlines. We believe that discipline is essential for developing the habits of mind necessary for lifelong learning and success.

Objectives of the University

The objectives of West Midlands Open University are:

1. Accessible education of the highest standard, this goal consists of using modern technology to enhance learning experience and to make education accessible to a teeming population of Nigerians and anyone else desirous of quality education;

2. Creation of enduring values in our learners, this goal encompasses stimulating awareness of cultural values, respect for others, lifelong thirst for knowledge, and passion for excellence, all of which will be achieved through our well-rounded world-class teaching and learning materials; and

3. The production of socially responsible and leadership-oriented graduates, this goal includes encouraging a spirit of independence, pragmatism and innovativeness in our learners.

Our Purpose

Equipping individuals for opportunities and enhancing society through education.

Core Values

Our unwavering commitment to excellence, innovation, social responsibility, collaboration, and continuous improvement propels us toward building a better world.

Motto of the University

Integrity, Leadership and Service

Preface

Welcome to the Department of Data Science at West Midlands Open University, a hub of innovation and academic excellence in the realm of data-driven discovery and decision-making. As we stand at the forefront of the Information Age, the importance of data science has never been more pronounced, influencing every facet of our lives, from business and healthcare to social sciences and beyond.

Our journey begins with a commitment to excellence in education. The Department of Data Science is dedicated to providing a robust academic foundation that equips students with the skills and knowledge necessary to thrive in a data-driven world. Our faculty members, a distinguished group of experts and practitioners, bring a wealth of experience and passion for the field, ensuring that our students receive a top-tier education.

At the heart of our department lies a commitment to advancing the frontiers of knowledge through groundbreaking research. Our faculty members actively engage in cutting-edge research projects that push the boundaries of what is possible in data science. From developing novel algorithms to addressing real-world challenges, our research initiatives contribute not only to academic discourse but also to the practical solutions that drive technological and societal advancements.

Students have the opportunity to participate in research projects, working alongside faculty members to explore the exciting and ever-evolving field of data science. This hands-on experience empowers our students to become innovators and problem solvers, prepared to tackle the complex issues that define the data landscape.

In recognition of the inherently interdisciplinary nature of data science, our department fosters collaboration across disciplines. We believe that the most impactful solutions emerge when diverse perspectives converge. To this end, we encourage partnerships with other departments, industry leaders, and research institutions. Through these collaborations, our students and faculty have the opportunity to apply data science principles to real-world challenges, enriching their educational experience and contributing to the greater body of knowledge.

The Department of Data Science at West Midlands Open University is a vibrant community of learners, researchers, and practitioners dedicated to shaping the future of data science. As you embark on your journey with us, we invite you to explore the

limitless possibilities that data science offers and to join us in the pursuit of knowledge, innovation, and positive societal impact.

Welcome to a transformative academic experience at the Department of Data Science, where we turn data into insights and insights into progress.

Prof Odun-Ayo Isaac Ayodeji
Head of Department,
Department of Data Science

1.0 About the Programme

The Data Science program at West Midlands Open University is a cutting-edge and comprehensive educational journey designed to equip students with the knowledge and skills essential for thriving in the dynamic field of data science. This program is meticulously crafted to foster a deep understanding of data analytics, machine learning, and artificial intelligence, providing a solid foundation in the fundamental principles and advanced techniques shaping the data-driven era.

Through a blend of theoretical concepts and hands-on practical experiences, students engage with real-world data challenges, gaining the expertise to extract meaningful insights and make informed decisions. Our curriculum encompasses a diverse range of topics, including data mining, statistical analysis, predictive modeling, and data visualization, ensuring graduates are well-prepared to address the complexities of the data landscape.

Guided by a team of experienced faculty members and industry experts, students in the Data Science program embark on a transformative educational journey. The program not only focuses on technical proficiency but also emphasizes the ethical considerations and responsible use of data, preparing graduates to contribute meaningfully to the evolving field of data science.

1.1 Name of the Programme:

B.Sc. Data Science

1.2 Code of the Programme

All Data Science courses are designated “DTS''. Faculty courses are designated “COS'' while General studies courses are designated "GST" and "ENT". Courses from the Faculty of Science are designated MTH and PHY.

1.3 Description of the Programme and Duration

The B.Sc. Data Science program consists of two semesters of formal University Studies per academic session. In the 200 and 300 levels, the traditional 12-week Students Industrial Work Experience Scheme (SIWES) during long vacations is now spread across these levels, ensuring students have a maximum of 24 weeks for industrial attachment,

which runs concurrently with their studies. After the attachment, students are required to write, present, and defend a report on their industry experience.

In the 400 Level, each student undertakes a year-long project in a field of their choice, in addition to the usual prescribed courses. A report on this project is also to be presented and defended.

The B.Sc. Data Science program is designed to be completed in four sessions (eight semesters) for students admitted at 100 level and three sessions (six semesters) for those admitted at 200 level. It's important for students to aim to graduate within the prescribed time frame. However, in cases where students cannot graduate within the regular number of sessions, those admitted at 100 level have a maximum of six sessions (12 semesters) to complete their degree, while those admitted at 200 level have a maximum of five sessions (10 semesters).

1.4 Semester Duration

A semester is divided into 8 weeks of classes, one week for mid semester break, one week for out of class experience and project based learning, two weeks of revision and two weeks for final examinations. Students who chose the part time mode will require a minimum of eight sessions to complete the BSc programme in Data Science.

2.0 Programme Philosophy, Vision and Mission

2.1 Philosophy

The philosophy of the Data Science program is centered on empowering learners to critically analyze and acquire specialized knowledge, enabling a profound understanding of the complexities surrounding unimpeded social and structural transformations. Emphasis is placed on examining how these variations manifest in diverse localized responses to national and regional development strategies. The program's primary mission is to graduate individuals equipped with essential skills, capabilities, and relevant knowledge attained through flexible and accessible learning methods. These empowered graduates are well-prepared to make significant contributions to technological

innovation and research, effectively addressing real-world challenges within the continually evolving domain of data science.

2.2 Vision

The vision of the Data Science program at West Midlands Open University is to be recognized as a leading academic initiative, providing cutting-edge education in the field of data science. We aim to deliver high-quality learning experiences that empower students to excel in the data-driven era, fostering innovation, research, and excellence in addressing complex challenges.

2.3 Mission

The mission of the Data Science program at West Midlands Open University is to provide a dynamic and inclusive learning environment that equips students with the knowledge, skills, and ethical values necessary to thrive in the rapidly evolving field of data science. We are committed to fostering critical thinking, innovation, and research excellence, enabling graduates to make meaningful contributions to technological advancements and address real-world challenges in diverse sectors.

3.0 Aim and Objectives

3.1 Aim

The aims of the Data Science program at West Midlands Open University are to:

1. Cultivate a deep understanding of data science principles, methodologies, and techniques.

2. Foster critical thinking and analytical skills to address complex problems in various domains.

3. Provide hands-on experience with cutting-edge tools and technologies used in the field of data science.

4. Encourage interdisciplinary collaboration and exploration of diverse applications of data science.

5. Instill a commitment to ethical practices, responsible data use, and societal impact in the realm of data science.

3.2 Objectives:

The objectives of the Data Science program at West Midlands Open University are:

1. Develop students' proficiency in data acquisition, preprocessing, and analysis techniques.
2. Equip students with a strong foundation in machine learning algorithms and statistical modeling.
3. Provide practical experience in working with big data technologies and tools.
4. Cultivate skills in data visualization and effective communication of insights derived from data.
5. Foster an understanding of ethical considerations, privacy concerns, and legal aspects related to data science practices.

3.3 General Learning Outcomes

Upon successful completion of the Data Science program at West Midlands Open University, students will:

1. Demonstrate advanced proficiency in collecting, processing, and analyzing diverse datasets using cutting-edge technologies and methodologies.

2. Apply machine learning algorithms and statistical models to solve complex problems and make informed decisions.

3. Showcase competence in utilizing big data tools and platforms for efficient data management and processing.

4. Effectively communicate data-driven insights through meaningful visualizations and reports.

5. Exhibit a strong awareness of ethical considerations, privacy issues, and legal implications in the field of data science.

3.4 Unique Features of the Programme

The distinctive features of the Data Science program at West Midlands Open University include:

1. Interdisciplinary Approach: A comprehensive curriculum that integrates concepts from computer science, statistics, and domain-specific knowledge to provide a holistic understanding of data science.

2. Hands-On Practical Learning: Emphasis on practical applications through real-world projects, allowing students to gain hands-on experience in solving industry-relevant challenges.

3. Cutting-Edge Technologies: Exposure to the latest tools, techniques, and technologies in data science, ensuring graduates are well-versed in industry-standard tools used for data analysis and machine learning.

4. Industry Collaboration: Collaborative initiatives with industry partners, providing students with opportunities for internships, projects, and exposure to real-world data science scenarios.

5. Flexibility and Adaptability: Adaptable learning methods that cater to the evolving landscape of data science, enabling students to stay current with emerging trends and technologies in the field.

6. Focus on Ethical Considerations: Integration of ethical principles in data science practices, fostering a responsible and conscientious approach to handling data and making informed decisions.

7. Research Opportunities: Encouragement and support for research activities, enabling students to contribute to the advancement of knowledge in data science through projects and publications.

3.5 Employability Skills

In Nigeria, much like in numerous other countries, there exists a wealth of opportunities for individuals with computing expertise. Nonetheless, due to the fierce competition in the job market, possessing a solid Data Science degree, while important, might not be adequate for securing employment. Employers are increasingly seeking candidates who can demonstrate a range of employability skills, including effective communication, teamwork, organizational and management capabilities, critical thinking, leadership, technological proficiency, and self-management. The courses within this program have been customized to foster and enhance the acquisition of these skills among program graduates.

Among the 21st Century skills emphasized in this program are creativity, information literacy, media literacy, adaptability, interpersonal skills, problem-solving, collaboration, global awareness, innovation, and critical thinking.

4.0 Programme Requirements

4.1 Admission requirements

- For entry at 100 level, the candidate is expected to have Five Ordinary Level (O/L) credit passes at not more than two sittings, including English Language, Mathematics, Physics, and two other science-related subjects.
- For entry into 200 level, the candidate is expected to have a minimum of any of the following
    1. A-level Credit in English Language, Mathematics, Physics, Chemistry, Biology or Agricultural Sciences

2 Upper Credit at Ordinary National Diploma OND from a recognised institution in Computer Engineering, Statistics, Computer Science, Electrical Electronics Engineering, or Electrical Engineering

- For entry into 300 level, the candidate is expected to have a minimum of any of the following;
    1 A minimum of lower credit at the Higher National Diploma HND from a recognised institution in Computer Engineering, Computer Science, Electrical Electronics Engineering, or Electrical Engineering, Statistics.

4.2 Graduation requirements

To be eligible for the award of the Bachelor degree in Data Science, a student must have:

1. passed all the core courses, university and faculty/school required courses and electives;
2. accumulated a minimum of 120 course units for students admitted in 100 level and 90 course units for students admitted to 200 level; and
3. attain a minimum CGPA of 1.00.

To graduate, a student must be found worthy in character throughout the period of his/her studentship and must accumulate the total units prescribed for the programme from Core, Faculty and General Studies courses as well as SIWES, Seminar and Final Year Project.

5.0 Programme Structure and Degree Rules

To satisfy the University Regulation for the award of B.Sc. Data Science students must have a minimum of 121 credit units. The courses are to be selected from both the compulsory and elective courses. A student must register for at least 15 credit units and a maximum of 24 credit units per semester. The maximum credit unit may be waived in exceptional circumstances on the merits of each case by the Head of the Department on behalf of the Senate to reflect the ODL model of the University.

Compulsory Courses C : These courses are essential for successful completion of the programme and are factored into the final grade regardless of the number of attempts allowed by the programme.

Elective Courses E : Students have the freedom to select these courses based on their interests and guidance from their course advisor. These additional courses complement the degree requirements, and passing them is recommended as they contribute to the final grade calculation.

6.0 Deferment

In order to request a deferral for either a semester or an entire session, students are required to complete and submit a formal application to the Vice-Chancellor. This application should follow a process involving review and approval by the Head of Department and the Dean of Faculty, with the final decision resting with the Senate. To ensure timely consideration and approval, it is crucial to submit the application well in advance.

Grounds for requesting deferment include:

(i) Issues related to admission
(ii) Health-related concerns
(iii) Emotional stress
(iv) Other exceptional circumstances

7.0 Examination Guidelines

Following the conclusion of each semester, examinations are typically administered, which may encompass written tests, oral assessments, practical evaluations, CBT proctoring, project submissions, or a combination of these, as sanctioned by the Senate. The examination outcomes generally encompass the assessment of Continuous Assessment (C.A.) from coursework..

7.1 Eligibility to write End of Semester Examination

In order to qualify for examinations, it is compulsory to have a minimum online participation/completion rate of 75% in all classes, tutorials, laboratories, and other pertinent activities.

7.2 Examination Conduct

1. Examinations are supervised at designated West Midlands Open University CBT centers. Students are required to be present at the examination venue a minimum of 30 minutes before the scheduled exam time. Late entry is permitted up to 30 minutes after the exam has commenced, but no additional time will be granted. During the first hour and the final 15 minutes of the examination, students are not allowed to leave the venue.

2. If a student needs to leave the examination room, re-entry is allowed only if they have been continuously observed by an Invigilator/Assistant Invigilator.

3. For each examination, students must carry and display their ID card and Examination Card on their desks, signing the provided Attendance List with their name and matriculation number.

4. The examination room strictly prohibits the presence of books, printed materials, written documents, or unauthorized items, except as allowed by the exam paper regulations. Students are not permitted to offer or receive assistance from other students or use unauthorized devices during the examination.

5. If a student is suspected of violating these rules, cheating, or engaging in disruptive behavior, the Department should promptly report the incident to the Faculty Examination Officer and the Dean. The Dean will initiate an investigation and report to the Board of Examiners. The student involved will be allowed to continue the examination unless their actions cause further disturbance. The Board of Examiners may subsequently recommend to the Faculty Board and Senate whether the student's exam should be accepted and any further actions to be taken.

6. Students are instructed to clearly write their examination number at the top of the cover of each answer booklet or a separate sheet of paper if required. The use of scrap paper is not allowed; all rough work should be completed in the answer booklet, which should be submitted to the invigilator. No printed question papers or any other provided materials should be taken from the examination room or defaced.

7. At the conclusion of the designated examination time, students must cease writing upon the invigilator's instruction and allow for the collection of their answer scripts.

7.3 Discipline

The examination regulation outlined above is binding on all students, and any violation of these rules will result in serious consequences, as specified below:

1. Expulsion from the University: The following offences will lead to expulsion:
    a. Impersonation during examinations, which includes exchanging examination numbers, name/answer sheets, or intentionally using someone else's examination number.
    b. Exchanging relevant materials in the examination hall, such as question papers containing relevant jotting and materials.
    c. Exchanging answer scripts.
    d. Introducing unauthorised materials into the examination hall.

2. Rustication for one academic year: The following offences will result in rustication for one academic session:
    a. Non-submission or incomplete submission of answer scripts.
    b. Collaboration or copying from other students.
3. Written Warning: The following offences will warrant a written warning:
    a. Speaking or engaging in conversation during the examination.
    b. Writing on question papers.

These punishments are in place to ensure the integrity of the examination process and to discourage any form of misconduct or cheating. Students are expected to adhere to these rules and regulations strictly to maintain academic honesty and uphold the West Midlands Open University's standards.

8.0 Grading System

Continuous assessment comprising tests, assignments, and other suitable methods contributes 40% to the overall evaluation during the semester. The examination conducted at the end of the semester holds a weightage of 60%. The final grade for each course is determined based on a total of 100% marks, combining both continuous assessment and end-of-semester examination results. The score from each course is assigned appropriate letter grade as follows:

(i) Credit Units	(ii) Percentile Scores	(iii) Letter Grades	(iv) Grade Points (GPA)	(v) Grade Point Average (GPA)	(vi) Cumulative Grade Point Average (CGPA)	(vii) Class of Degree
Vary according to contact hours assigned to each course per week per semester	70 - 100	A	5	Derived by multiplying (i) and (iv) and	4.50 – 5.00	First Class
	60 - 69	B	4		3.50 4.49	2nd Class Upper

and according to workload carried by each student	50 - 59	C	3	dividing by Total Credit Units	2.40 – 3.49	2nd Class Lower
	45 - 49	D	2		1.50 2.39	Third Class
	40 - 44	E	1		1.00 1.49	Pass Degree
	0 – 39	F	0		-	-

8.1 Academic Standing Categories: Clear, Warning, Probation, and Withdrawal

The academic standing of students is determined by their Cumulative Grade Point Average CGPA , with the minimum acceptable CGPA set at 1.00.

1. Clear Academic Standing: To be in Clear Academic Standing, a student must maintain a CGPA of not less than 1.00.
2. Warning: A warning is issued to a student whose CGPA falls below the minimum tolerable level for the first time. This warning is typically communicated through verbal advice by the Level Coordinator, ensuring the student understands the implications of falling below the minimum CGPA in the subsequent semester examinations.
3. Academic Probation: Academic Probation is assigned to a student who fails to maintain a minimum CGPA of 1.00 by the end of the session. The probationary status can be reversed if the student achieves a CGPA of at least 1.00 in any subsequent semester after the first year. The responsibility for reversing the probationary status lies with the student. The University will provide a written preliminary notice of poor academic standing to the student.

4. Withdrawal for Academic Failure: If a student fails to maintain a CGPA of 1.00 for two 2 consecutive Academic Sessions at the end of any session, they will be required to withdraw from the academic program due to academic failure.

9.0 Departmental Issue Resolution Process

The procedure for handling student-related matters includes the following stages:

1. In the initial step, students are advised to either report via email or hold a discussion regarding their concerns with their Course Level Coordinator or Academic Student Adviser.

2. If the issue surpasses the purview of the Coordinator or Student Adviser, it will be elevated to the Examination Officer in the case of academic concerns, or to the Head of Department.

3. In cases where a resolution cannot be reached through the preceding steps, the matter will be formally brought to the attention of the Dean of the Faculty for additional review and resolution.

10.0 Outline of Course Structure

100 Level 1st Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH
1	MAT 101	Elementary Mathematics I - Algebra and Trigonometry	2	core		
2	PHY101	General Physics I – Mechanics	2	core		
3	PHY103	General Practical Physics I - Mechanics	1	core		
4	COM 101	Introduction to Computers	3	core		
5	GST 101	Use of English and Communication Skills I	2	core		
6	GST 109	Use of Library and ICT skills	2	core		
7	BUA 101	Introduction to Business I	2	core		
8	BUA 107	Logic and Critical Thinking	2			

Note: Two (2) units Elective(s) required TOTAL **16**

100 Level 2nd Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH
1	PHY 102	Electricity & Magnetism	2	core		
2	PHY104	General Practical Electricity & Magnetism	1	core		
3	MAT 102	Algebra and Trigonometry	2	core		
4	MAT 104	Introduction to Statistics	3	core		
5	COM 142	Problem Solving	3	core		
6	GST 102	Nigerian People and Culture	2	Core		
7	COM 102	Information Technology System Hardware and Software	2	Core		
8	BUA 122	Introduction to Entrepreneurial Skills	2	Core		

Note: Two (2) units Elective(s) required TOTAL **17**

200 Level 1st Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH
1	DTS 201	Introduction to Data Science	2	core		
2	COM 201	Discrete Structures	2	core		
3	MAT 201	Mathematical Methods I	2	core		
4	COM 205	Principles of Programming I	3	core		
5	GST 201	Philosophy, Logic and Human Existence	2	core		
6	ENT 211	Entrepreneurship and Innovation	2	core		
7	INS 207	Introduction to Information Systems	2	Elective		

200 Level 2nd Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH
1	COM 208	Principles of Programming II	3	core	30	45
2	SIW 200	SIWES	3	core		135
3	MAT 204	Sets, Logic and Algebra I	2	core		
4	DTS 242	Statistical Computing Inference and Modelling	3	core		
5	DTS 204	R Programming	2	core		
6	INS 242	Principles of Information Systems	3	Elective		
7	INS 202	Human Computer Interaction	3	Elective		

8	CYS 212	Systems Analysis and Design	3	Elective		
9	CYS 202	Introduction to Cybersecurity	2	Elective		
10	COM 222	Introduction to Web Authoring	2	Elective		

300 Level 1st Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH
1	**COM 307**	Principles of Database Systems	3	core	15	45
2	ENT 312	Venture Creation	2	core	30	
3	DTS 303	Probability for Data Science	3	core	45	
4	**DTS 301**	Ethics and Legal Issues in Data Science	2	core	45	
5	COM 301	Data & Computer Communications	3	Elective	30	45
6	INS 387	Applications in Information Security and Assurance	2	Elective		
7	**INS 321**	Database Security and Auditing	3	Elective		
8	COM 305	Principles of Operating Systems	3	Elective		
9	**COM 311**	Web Application Development	3	Elective		
10	**DTS 321**	Biostatistics	3	Elective		

300 Level 2nd Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH
1	DTS 302	Big Data Computing	2	core		
2	DTS 304	Data Science Innovation and Entrepreneurship	2	core		
3	SIW 300	SIWES II	3	core		135
4	GST 312	Peace and Conflict Resolution	2	core		
5	CYS 202	Introduction to Cyber Security	2	Elective		
6	INS 314	Information Security Management	3	Elective		
7	DTS 328	Statistical Methods in Data Science	3	Elective		
8	DTS 322	Financial Data Analytics	3	Elective		
9	INS 316	Principles of information security	3	Elective		

400 Level 1st Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH
1	TRP 401	Technical Report Writing	3	core		
2	DTS 417	Project Management	2	core		
3	DTS 477	Design Project	3	core		

4	**DTS 401**	**Data Visualisation**	**2**	**core**		
5	**INS 471**	**Advanced Databases**	**2**	**Elective**		
6	**COM 411**	**Distributed and Cloud Computing**	**3**	**Elective**		
7	**COM 421**	**Computer Graphics and Visualization**	**3**	**Elective**		
8	**DTS 423**	**Machine Learning with Deep Learning**	**3**	**Elective**		
9	**INS 423**	**Information Technology and Business Analytics**	**3**	**Elective**		
10	**INS 425**	**Database Administration**	**3**	**Elective**		

400 Level 2nd Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH
1	DTS 479	Design Project	3	core		
2	DTS 422	Fundamentals of Data Mining	3	core		
3	COM 412	Data Mining	3	Elective		
4	CYS 412	Deep and Dark Web Security	2	Elective		
5	INS 422	Database Analysis and Design	3	Elective		
6	INS 424	Information Resource Management	3	Elective		

7	DTS 424	Statistical Computing with SAS and R	3	core		
8	INS 412	Ethics, Quality and Sustainability in Technological Environments	2	Elective		
9	BUA 412	Analysis for Business Decisons	3	Elective		
10	BUA 410	Management Information System	2	Elective		

11.0 Curriculum/Syllabus of all Courses in the Programme

100 Level Courses

Course code	**MAT 101**
Course title	Elementary Mathematics I - Algebra and Trigonometry

Weight	2 Credit Units C LH 30
Learning Outcomes	At the end of the course, students should be able to: 1. Understand the basic definition of Set, Subset, Union, Intersection, Complements and use of Venn diagrams; 2. Solve quadratic equations; 3. Solve trigonometric functions; 4. Understand the various types of numbers; 5. Solve some problems using Binomial theorem; Apply mathematical concepts and skills to solve real-world problems; 6. Communicate mathematical ideas clearly and concisely, both verbally and in writing; 7. Use technology effectively to solve mathematical problems and create mathematical representations; 8. Work collaboratively to solve mathematical problems and learn from each other.
Course content	Introduction to Elementary Mathematics. Real Numbers. Real Sequences and Series. Quadratic Equations. Binomial Theorems. Complex Numbers. De-Moivre's Theorem. Circular Measure. Trigonometry Identities. Application of Trigonometry.

Course code	**PHY 101**
Course title	**General Physics I – Mechanics**
Weight	2 Credit C; LH 30

Learning Outcomes	At the end of the course, students should be able to: 1. describe the electric field and potential, and related concepts, for stationary charges; 2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential; 3. describe and determine the magnetic field for steady and moving charges; 4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law; 5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws; 6. explain the basic physical of Maxwell's equations in integral form; 7. evaluate DC circuits to determine the electrical parameters;
Course content	Introduction to Space and Time Units and Dimensions. Vectors and Scalars. Differentiation of Vectors. Displacement, Velocity, and Acceleration. Kinematics. Newton's Laws of Motion. Application of Newtonian Mechanics. Conservation Principles in Physics. Electrostatics.
Course code	**PHY103**
Course title	**General Practical Physics I - Mechanics**
Weight	(1 Units C: LH 15 PH 45)
Learning Outcomes	By the end of this course, students should be able to: 1. Conduct measurements of some physical quantities; 2. Make observations of events, collect and tabulate data; 3. Identify and evaluate some common experimental errors; 4. Plot and analyse graphs; and 5. Conclude numerical and graphical analysis of data. 6. Apply the principles of mechanics to solve practical problems; 7. Use various tools and equipment to safely and accurately conduct experiments; 8. Design and carry out experiments to test hypotheses; 9. Communicate scientific findings effectively, both verbally and in writing; and

	10. Draw conclusions from numerical and graphical analysis of data. 11. Work collaboratively to solve problems and achieve common goals
Course content	Introduction to General Practical Mechanics. Measurements and Error Analysis. Mechanical Systems. Electrical and Mechanical Resonant Systems. Light and Heat. Viscosity and Fluids. Designing and Building Simple Mechanical Systems. Friction and Wear. Lubrication and Bearings. Applying Mechanics to Solve Practical Problems.
Course code	**COM 101**
Course title	**Introduction to Computers**
Weight	(3 Units C: LH 30)
Learning Outcomes	On successful completion of this module, students will be able to: 1. Explain the basic components of computers and other computing devices; 2. Describe the various applications of computers; 3. Explain information processing and its roles in the society; 4. Describe the Internet, its various applications and its impact; 5. Explain the different areas of the computing discipline and its specialisations and 6. Demonstrate practical skills in using computers and the Internet. Understand the principles of problem-solving and algorithm design 7. Understand the basics of programming languages. 8. Understand data structures and algorithms 9. Understand the different operating systems 10. Understand computer networks 11. Understand the ethical and social implications of computing
Course content	Understanding the Computer. Computer Hardware. Computer Software and Humanware. Programming The Computer. Information Processing. Information processing and its roles in society. The

	Internet, its applications and its impact on the world today. Cloud computing. Big data. The future of computing.
Course code	**GST 101**
Course title	**Use of English and Communication Skills I**
Weight	(2 Units C: LH 30)
Learning Outcomes	On successful completion of this course, students will be able to: 1. Understand the importance of English and communication skills in various personal and professional contexts. 2. Demonstrate a solid foundation in English grammar, vocabulary, and sentence structure. 3. Employ effective reading strategies to comprehend and analyse different types of texts. 4. Enhance their listening skills and effectively interpret spoken English. 5. Develop clear and coherent writing skills for different purposes and audiences. 6. Utilise idiomatic expressions and expand their vocabulary to enhance communication. 7. Apply active listening and non-verbal communication skills in interpersonal interactions. 8. Engage in effective oral communication, including presentations, group discussions, and debates. 9. Apply business communication skills, such as writing professional emails and conducting meetings. 10. Demonstrate practical interpersonal skills, including empathy, conflict resolution, and cultural sensitivity. 11. Employ digital communication skills and media literacy to navigate online platforms and evaluate information. 12. Prepare for job interviews and effectively communicate their qualifications and experiences. 13. Demonstrate an understanding of netiquette, ethical communication, and responsible use of technology. 14. Develop critical thinking skills to analyse and evaluate written and spoken content.

	15. Engage in self-reflection and continuous improvement of their English and communication skills. 16. Identify possible sound patterns in the English language to enhance pronunciation and communication. 17. List notable language skills, including listening, speaking, reading, and writing, and demonstrate proficiency in each area. 18. Classify word formation processes, such as affixation, compounding, conversion, and blending, to expand vocabulary and understand word relationships
Course content	Introduction to English and Communication Skills. Building Strong Foundations in English. Enhancing Vocabulary and Idiomatic Expressions. Developing Effective Writing Skills. Mastering Oral Communication. Listening and Comprehension Skills. Effective Business Communication. Interpersonal Skills and Building Relationships. Effective Interviewing Skills. Digital Communication and Media Literacy.
Course code	GST 109
Course title	**Use of Library and ICT skills**
Weight	2 Units C LH 30
Learning Outcomes	On successful completion of this module, students will be able to: 1. Demonstrate a comprehensive understanding of information literacy and its importance. 2. Effectively search, retrieve, and evaluate information from various sources. 3. Understand the different types of library resources and their utilisation. 4. Use their digital literacy and ICT skills for academic and professional applications. 5. Develop critical thinking and problem-solving abilities through research and information analysis. 6. Foster ethical and responsible use of information and technology.

Course content	Overview of library; Types of library; Sources of Information Cataloging and Classification; Library rules and regulations Introduction to information and communication technology (ICT) Introduction to Computer; Internet ; Introduction to Network Computer Threats
Course code	**BUA 101**
Course title	**Introduction to Business I**
Weight	2 Units C LH 30
Learning Outcomes	On successful completion of this module, students will be able to: 1. Demonstrate a comprehensive understanding of various forms of business ownership, ethical considerations, and the role of social responsibility in business decision-making. 2. Apply effecti ve communication strategies in a business context, including written, verbal, and non-verbal communication, while identifying and overcoming barriers to communication. 3. Analyse and evaluate key management and leadership principles, including the functions of management and different leadership styles, to effectively contribute to organisational success. 4. Evaluate economic theories and their implications for business operations, demonstrating an understanding of macroeconomic and microeconomic concepts and their relevance in decision-making. 5. Interpret financial statements, utilise cost accounting techniques, and analyse marketing strategies to make informed business decisions and contribute to organisational growth.
Course content	Overview of Business. Types of Business Operations. Business Ethics and Social Responsibility. Business Planning and Strategy. Management and Leadership. Economics for Businesses. Accounting and Financial Statements. Marketing. Business Communication. Legal and Regulatory Environment

Course code	BUA 107
Course title	**Logic and Critical Thinking**
Weight	2 Units C LH 30
Learning Outcomes	On successful completion of this module students will be able to: 1. Understand the basic concepts of logic and its importance in critical thinking and reasoning. 2. Apply logical principles to evaluate the strength and validity of arguments. 3. Break down arguments into their components (premises, conclusion) and identify the underlying assumptions. 4. Evaluate the strength of evidence and the relevance of premises to the conclusion. 5. Construct counterarguments and identify weaknesses or flaws in an argument. 6. Understand the concept of conditional statements and their components (antecedent, consequent). 7. Identify and avoid common conditional fallacies, such as affirming the consequent and denying the antecedent. 8. Understand the symbols and syntax of propositional logic, including logical operators (and, or, not), propositional variables, and truth tables. 9. Identify and analyse different types of fallacies, including ad hominem, slippery slope, hasty generalisation, equivocation, and straw man fallacy. 10. Identify and evaluate analogies effectively. 11. Define inductive reasoning and its distinction from deductive reasoning. 12. Define problem-solving and critical thinking and their relationship to each other. 13. Identify the key steps in the problem-solving process, including problem identification, analysis, solution generation, evaluation, and implementation. 14. Recognize the different types of information sources, including primary, secondary, and tertiary sources.

	15. Verify information using fact-checking websites and tools, and seek corroborating evidence from multiple sources. 16. Cite and reference sources accurately and appropriately using different citation styles, such as APA or MLA. 17. Define categorical propositions and their components, including quantifiers (all, some, none), subjects, and predicates. 18. Identify the four types of categorical propositions (A, E, I, and O) and their symbolic representations. 19. Understand the concept of conversion, contraposition, and obversion of categorical propositions.
Course content	Introduction to Logic. Argument Analysis. Conditional Reasoning. Propositional Logic. Fallacies. Reasoning with Analogy. Inductive Reasoning. Problem-Solving and Critical Thinking. Evaluating Sources and Information. Categorical Propositions.

Course code	**PHY 102**
Course title	**Electricity & Magnetism**
Weight	2 Units C LH 30
Learning Outcomes	At the end of the course, students should be able to: 1. describe the electric field and potential, and related concepts, for stationary charges; 2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential; 3. describe and determine the magnetic field for steady and moving charges; 4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law; 5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws; 6. explain the basic physical of Maxwell's equations in integral form; 7. evaluate DC circuits to determine the electrical parameters;

	8. determine the characteristics of ac voltages and currents in resistors, capacitors, and Inductors.
Course content	Introduction to Forces in Nature. Electric Charge and Its Properties. Coulomb's Law and Superposition. Electric Field and Potential. Gauss's Law and Capacitance. Electric Dipoles and Energy in Electric Fields. Magnetic Fields and Lorentz Force. Electromagnetic Induction and Faraday's Law. Maxwell's Equations and Electromagnetic Waves. AC Voltages and Currents in Circuits.
Course code	**PHY102**
Course title	**General Practical Electricity & Magnetism**
Weight	1 Unit; PH 45
Learning Outcomes	At the end of the course, students should be able to: 1. conduct measurements of some physical quantities; 2. make observations of events, collect and tabulate data; 3. identify and evaluate some common experimental errors; 4. plot and analyse graphs; and 5. draw conclusions from numerical and graphical analysis of data.
Course content	This introductory course emphasises quantitative measurements, the treatment of measurement errors, and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of metres, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc., covered in PHY 101 and PHY 102. However, emphasis should
Course code	**MAT 102**
Course title	**Elementary Mathematics II – Calculus**
Weight	2 Units C LH 30

Learning Outcomes	By the end of the course, students will be able 1. to differentiate and explain rules in calculus, 2. analyse real-variable functions and graphs, 3. grasp limits and continuity, 4. understand derivatives as the rate of change limits, and gain proficiency in integration techniques and definite integrals for solving area and volume problems.
Course content	Function of a real variable, graphs, limits and idea of continuity. The derivative is the limit of the rate of change. Techniques of differentiation. Extreme curve sketching; Integration as an inverse of differentiation. Methods of integration, Definite integrals. Application to areas, volumes.
Course code	**MAT 104**
Course title	**Introduction to Statistics**
Weight	3
Learning Outcomes	Upon completion of this course, students will be able to: 1. explain the differences between permutation and combination; 2. explain the concept of random variables and relate it to probability and distribution functions; 3. describe the basic distribution functions; 4. explain the concept of exploratory data analysis; 5. apply statistical methods to solve real-world problems; 6. interpret and communicate statistical results effectively; 7. use statistical software to analyse data; 8. understand the ethical implications of using statistics.
Course content	Introduction to Statistical Methods. Descriptive Statistics. Statistical Distributions. Sampling and Estimation. Permutation and Combination. Hypothesis Testing. Statistical Analysis. Probability. Use of Statistical Software to Analyse Data. Module Summary.

Course code	**COM 142**
Course title	**Problem Solving**
Weight	3
Learning Outcomes	At the end of this course, students should be able to: 1. explain problem-solving processes; 2. demonstrate problem-solving skills; 3. describe the concept of algorithm development and properties of algorithms; 4. discuss the solution techniques of solving problems; 5. solve computer problems using algorithms, flowcharts, pseudocode, etc.; and 6. solve problems using programming languages using C, PYTHON, etc.
Course content	Introduction to Computing and Problem Solving. Methods of Solving Computing Problems. Solution Techniques for Problem Solving. Additional Solution Techniques. Advanced Problem-Solving Techniques. Problem-Solving Strategies. Solution Formulation and Design. Programming Basics - Part 1. Programming Basics - Part 2. Application and Practice.
Course code	**GST 102**
Course title	**Nigerian People and Culture**
Weight	2 Units C LH30
Learning Outcomes	On successful completion of this module, students will be able to: 1. Analyse the historical foundation of the Nigerian culture and arts in pre-colonial time 2. List and identify the major linguistic groups in Nigeria 3. Analyse the concepts of Trade, Economic and Self-reliance status of the Nigerian peoples towards national development 4. Know How to become a citizen of Nigeria 5. Enumerate the challenges of the Nigerian State towards Nation building

	6. Analyse the role of the Judiciary in upholding people's fundamental rights 7. Understand the role of Military in Nigerian Politics 8. Identify acceptable norms and values of the major ethnic groups in Nigeria 9. List and suggest possible solutions to identifiable Nigerian environmental, moral and value problems
Course content	Introduction to Nigeria's People and Culture. Northern Zone. Central Zone. Western Zone. Eastern Zone. Cultural Areas of Nigeria. The Evolution of Nigeria. Military in Nigerian Politics. Nigeria and the Wider World. Environmental , Moral and Value Problems.
Course code	**COM 102**
Course title	**Information Technology System Hardware and Software**
Weight	2
Learning Outcomes	At the end of this course, students should be able to: 1. Demonstrate Proficiency in Hardware Components: 2. Understand Operating System Functionality: 3. Develop Programming Skills: 4. Explore Software Applications: 5. Comprehend Network Architectures: 6. Enhance Communication Skills: 7. Understand Cybersecurity Principles: 8. Problem-Solving and Troubleshooting Skills: 9. Stay Informed about Technological Advancements: 10. Apply Ethical Practices: 11. Prepare for Industry Certification (Optional):
Course content	Introduction to IT Systems and Hardware. Operating Systems Fundamentals. Programming Basics. Software Applications and Development. Networking Essentials. Cybersecurity Principles. Midterm Assessment. Advanced Networking Concepts. System Integration Project. Final Presentations and Review.

Course code	**BUA 122**
Course title	**Introduction to Entrepreneurial Skills**
Weight	
Learning Outcomes	On successful completion of this module, students will be able to: 1. Students will understand fundamental entrepreneurship concepts and recognise the economic significance of entrepreneurship. 2. Identify the major classical, neoclassical, Austrian, and Schumpeterian entrepreneurial theories. 3. Develop effective business communication skills, both written and verbal, and enhance problem-solving and decision-making abilities crucial for entrepreneurial success. 4. Utilise negotiation skills to secure favourable outcomes in business deals, contracts, and partnerships. 5. Apply networking and leadership skills to expand one's professional network, foster collaboration, and achieve organisational success. 6. Understand the challenges and risks of entrepreneurship, including the risk of failure, the long hours and hard work, and the uncertainty of the business world. 7. Analyse the role of government policies, cultural factors, social networks and relationships, and access to technology in shaping the Nigerian entrepreneurial environment
Course content	Introduction to Entrepreneurship and Entrepreneurs. Entrepreneurial Theories. Types of Entrepreneurs. The Entrepreneurial Process. Entrepreneurial Skills: Negotiation. Entrepreneurial Skills: Networking, Leadership and Management Skills. Entrepreneurial Skills: Creative Thinking, Innovation Skills and Protection of Intellectual Property. Entrepreneurial Skills: Business Communication Skills, Problem-Solving and Decision-Making Skills.

	Entrepreneurial Skills: Identifying Entrepreneurial Opportunities and Finance Management. The Nigerian Entrepreneurial Environment.

200 Level Courses

Course code	DTS 201
Course title	Introduction to Data Science
Weight	(3 Units C: LH 30; PH 45)
Learning Outcomes	At the end of the course, the students should be able to: 1. demonstrate the principles of working with data across distributions, sizes and ranges; 2. explain from first principles the operations that power data-driven utilities that have transformed the modern computing industry; and 3. demonstrate foundational technological processes that enable various data functions.
Course content	Fundamentals of Data Science. Methodology of extracting knowledge from big datasets as well as various tools and platforms for Data Science. What is Data and why is it important? Basic classification of Data (Structured, semi-structured and unstructured data), Scope of Data Science, Steps of Data Science Process: Data collection, Pre-processing, training, and testing. Rudiments of data visualisations; Distributions, Probability, and Simulations; Predictions and Models. Use cases in various domains such Image, Natural Language, Audio and Video. Basic introduction to knowledge extraction: Data mining, Business Intelligence & Knowledge management, Introduction to Big Data integration and

	intelligence, Introduction to Data Analytics, Introduction to programming. Lab work: Practical experiments on data science process steps in simulated models. Practical application of the methods and tools used in data science for prediction models with some simulated exerises. Practical experiments on how to extract knowledge; how to mine valuable data from large set of data sets using data mining process and methods. Learn how to integrate business intelligence in big data along with some data analytics pratical exercises. Simple exercises on R programming to enhance the coding knowledge acquired during theory class.
Course code	COM 201
Course title	Discrete Structures
Weight	(2 Units C: LH 30)
Learning Outcomes	At the end of this course, the students will be able to: 1. convert logical statements from informal language to propositional and predicate logic expressions; 2. describe the strengths and limitations of propositional and predicate logic; 3. outline the basic structure of each proof technique (direct proof, proof by contradiction, and induction) described in this unit; 4. apply each of the proof techniques (direct proof, proof by contradiction, and induction) correctly in the construction of a sound argument; 5. apply the pigeonhole principle in the context of a formal proof; 6. compute permutations and combinations of a set, and interpret the meaning in the context of the particular application; 7. map real-world applications to appropriate counting formalisms, such as determining the number of ways to arrange people around a table, subject to constraints on the seating

	arrangement, or the number of ways to determine certain hands in cards (e.g., a full house); and 8. solve a variety of basic recurrence relations.
Course content	Propositional Logic. Predicate Logic. Sets. Functions. Sequences and Summation. Proof Techniques. Mathematical induction. Inclusion-exclusion and Pigeonhole principles. Permutations and Combinations (with and without repetitions). The Binomial Theorem. Discrete Probability. Recurrence Relations.
Course code	MAT 201
Course title	Mathematical Methods I
Weight	(2 Units C: LH 30)
Learning Outcomes	At the end of the course students should be able to: 1. describe Real-valued functions of a real variable; 2. solve some problems using Mean value Theorem and Taylor Series expansion; and 3. evaluate Line Integral, Surface Integral and Volume Integrals.
Course content	Real-valued functions of a real variable. Review of differentiation and integration and their applications. Mean value theorem. Taylor series. Real-valued functions of two and three variables. Partial derivatives chain rule, extrema, Lagrangian multipliers. Increments, differentials and linear approximations. Evaluation of line, integrals. Multiple integrals.
Course code	COM 205
Course title	Principles of Programming I
Weight	(3 Units C1: LH 30; PH 45)
Learning Outcomes	At the end of this course, students should be able to: 1. identify different programming paradigms and their approaches to programming; 2. write programmes using basic data types and strings; 3. design and implement programming problems using selection;

	4. design and implement programming problems using loops; 5. use and implement classes as data abstractions in an object-oriented approach; 6. implement simple exception handling in programmes; 7. develop programmes with input/output from text files; and 8. design and implement programming problems involving arrays.
Course content	Introduction to computer programming. Functional programming; Declarative programming; Logic programming; Scripting languages. Introduction to object-orientation as a technique for modelling computation. Introduction of a typical object-oriented language, such as Java. Basic data types, variables, expressions, assignment statements and operators. Basic object-oriented concepts: abstraction; objects; classes; methods; parameter passing; encapsulation. Introduction to Strings and string processing; Simple I/O; control structures; Arrays; Simple recursive algorithms; inheritance; polymorphism.
Course code	GST 201
Course title	Philosophy, Logic and Human Existence
Weight	2
Learning Outcomes	At the end of this course, students should be able to: Analyze the concept of humanity, including its origin, philosophical underpinnings, and cosmic environment. 2. Develop and enhance logical and critical thinking skills for effective problem-solving and decision-making. 3. Identify and appreciate the fundamental roles of science and technology within human society and services. 4. Describe both renewable and non-renewable environmental resources available in Nigerian society. 5. Recognize and apply resource conservation tools and techniques to promote sustainable environmental practices. 6. Analyze the environmental impacts of plastics and other forms of waste, and propose mitigation strategies.

	7. Suggest viable management techniques and solutions for identifiable environmental challenges faced in various areas of Nigerian society. 8. Identify and describe unethical behavior patterns that can hinder human societal growth and development.
Course content	Introduction to Humanity and Philosophy. Developing Logical and Critical Thinking Skills. Science and Technology in Human Society. Environmental Resources in Nigerian Society. Climate Change and Sustainable Development. Environmental Effects of Plastics and Waste. Elements of Environmental Studies. Environmental Challenges in Nigerian Society. National Development Plans for a Sustainable Environment. Global Action for Environmental Sustainability.
Course code	**ENT 211**
Course title	**Entrepreneurship and Innovation**
Weight	2Units C LH15 PH45
Learning Outcomes	Upon the completion of this course, students should be able to: 1. Explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation, and risk-taking; 2. State the characteristics of an entrepreneur; 3. Analyse the importance of micro and small businesses in wealth creation, employment, and financial independence; 4. Engage in entrepreneurial thinking; 5. Evaluate and apply funding strategies; 6. Identify key elements in innovation; 7. Design and execute innovative business models; 8. Describe stages in enterprise formation, partnership and networking, including business planning; 9. Describe contemporary entrepreneurial issues in Nigeria, Africa and the rest of the world; 10. Navigate legal and ethical challenges in entrepreneurship and

	11. State the basic principles of e-commerce.
Course content	Introduction to Entrepreneurship. Rationale and Relevance of Entrepreneurship. Characteristics of Entrepreneurs. Entrepreneurial thinking. Innovation and its dimensions. Enterprise formation and ownership. Contemporary Entrepreneurship Issues. Entrepreneurship in Nigeria. Overcoming Environmental and Cultural Barriers to. Entrepreneurship. Principles of E-Commerce.
Course code	**INS 207**
Course title	**Introduction to Information Systems**
Weight	2 Units C: LH 30
Learning Outcomes	At the end of this course, students should be able to: 1. explain system concepts and organisational processes; 2. explain information systems principles and application in modern organisation; 3. describe information technology security and related ethical issues; and 4. explain database management and system development life cycle.
Course content	Roles and relevance of information systems in organisations to conduct business and solve problems. Information systems principles in modern organisations. Systems concepts; organisational processes; technological aspects of information systems. The internet. Information technology security. Ethical issues. Database management. Systems development life cycle.
Course code	COM 208
Course title	Principles of Programming II
Weight	(3 Units C: LH 30; PH 45)

Learning Outcomes	At the end of this course, students should be able to: 1. develop solutions for a range of problems using object-oriented programming; 2. use modules/packages/namespaces for programme organisation; 3. use API in writing applications; 4. apply divide and conquer strategy to searching and sorting problems using iterative and/or recursive solutions; 5. explain the concept of exceptions in programming and how to handle exceptions in programmes; 6. write simple multithreaded applications; and 7. design and implement simple GUI applications.
Course content	Review and coverage of advanced object-oriented programming - polymorphism, abstract classes and interfaces. Class hierarchies and programme organisation using packages/namespaces. Use of API – use of iterators/enumerators, List, Stack, Queue from API; Searching; sorting; Recursive algorithms; Event-driven programming: event-handling methods; event propagation; exception handling. Applications in Graphical User Interface (GUI) programming.
Course code	SIW 200
Course title	SIWES
Weight	(3 Units C: PH 135)
Learning Outcomes	At the end of this training, students should be able to: 1. explain how a typical computer firm/unit operates; 2. describe the various assignments carried out and the skills acquired during the SIWES period; and 3. submit a comprehensive report on the knowledge acquired and the experience gained during the exercise.

Course content	Students are attached to private and public organisations for a period of three months during the second-year session long break with a view to making them acquire practical experience and to the extent possible, develop skills in all areas of Computer Science. Students are supervised during the training period and shall be expected to keep records designed for the purpose of monitoring their performance. They are also expected to submit a report on the experience gained and defend their reports.
Course code	MAT 204
Course title	Sets, Logic and Algebra I
Weight	(2 Units C: LH 30)
Learning Outcomes	At the end of the course, students should be able to: 1. solve various problems using the concepts of set theory; 2. understand Algebraic structures; and 3. understand the meaning of logic in mathematics. 4. Apply Basic Set Theory: Demonstrate proficiency in solving a variety of problems using the concepts of set theory, including mappings, relations, equivalence, and other relations. 5. Utilise Cartesian Products: Understand and apply the concept of Cartesian products, both in theory and practical problem-solving scenarios.
Course content	Introduction to Modern Mathematics. Basic Set Theory. Cartesian Products and Binary Logic. Methods of Proof. Binary Operations. Algebraic Structures - Semigroups and Rings. Algebraic Structures - Integral Domains and Fields. Homeomorphisms and Transformations. Number Systems and Properties. Recap and Final Assessment.
Course code	DTS 242
Course title	Statistical Computing Inference and Modelling
Weight	(3 Units C: LH 45)

Learning Outcomes	At the end of the course, the students should be able to: 1. make conclusions based on statistical assumptions, models and results; 2. make inference on statistical outcomes, and real-world implications and how these outcomes are factored into decision-making processes; 3. demonstrate the various considerations that are applied both for communicating statistical solutions to real problems; 4. make conclusions based on statistical models and results by applying a broad range of statistical tools and packages; and 5. demonstrate logical, meaningful skills that bothers not just on the relevance of the data that informed the statistical outcomes, but also on the real-world implications of how these outcomes are factored into decision-making processes.
Course content	Population and samples. Asymptotics. Statistical models and methodologies. Random sampling distributions. Elementary time series analysis. Index numbers. Demographic measures. Estimation (point and interval) and tests of hypotheses concerning population mean and proportion (one and two sample cases). Regression and correlation. Programming in Python computer language. Computation of mean, variance and correlation. Sorting and ranking of data. Data Step Processing. Preparing Data for Analysis. Evaluating Quantitative Data. Sample Size Estimation. Basic statistical computing in regression analysis and the analysis of designed experiments. Introduction to Monte Carlo methods. Use of statistical packages like SPSS, SAS, Minitab, GENSTAT, EPI-INFO, SYSTAT. Lab work: Practical experiments on statistical models and methodologies. Practical exercises on random sampling distribution methods. Practicals on test of hypothesis, population, mean, proportion, regression and correlation analysis. Exercise on how to sort and data from different data set. Use of SPSS for data analysis and computation.

Course code	DTS 204
Course title	Introduction to R Programming
Weight	(3 Units C: LH 30; PH 45)
Learning Outcomes	At the end of the course, the students should be able to: 1. utilise the R programming language for data-driven functions and utilities that have been lauded across the computing industry; 2. explain the structures, functions, and operations that power the utilities of this Language across various application domains; 3. explain the structures, functions, and operations of the language; and 4. apply the R programming language to various data-driven use-cases in practical problem domains in the real-world.
Course content	History and Overview of R, Installation, Introduction to R and RStudio, R interface, Cleaning and transforming data, Getting data in and out of R, Evaluation, R Objects, Numbers, Attributes, Vectors, Matrices/Arrays, Lists, Factors, Missing Values, Data Types, Structures and Frames, Names, , Displaying and plotting data, Reading lines of a Text File, Reading from a URL connection, Vectorised Operations, Dates and Times, Control Structures, Functions, Scoping Rules, Coding Standard for R, Looping, Debugging, Profiling R Code. Creating data products using R package.
Course code	INS 242
Course title	Principles of Information Systems
Weight	(3 Units E: LH 30)
Learning Outcomes	At the end of this course, students should be able to: 1. explain system concepts and organisational processes;

	2. explain information systems principles and application in modern organisation; 3. describe information technology security and related ethical issues; and 4. explain database management and system development life cycle.
Course content	Roles and relevance of information systems in organisations to conduct business and solve problems. Information systems principles in modern organisations. Systems concepts; organisational processes; technological aspects of information systems. The internet. Information technology security. Ethical issues. Database management. Systems development life cycle.
Course code	INS 202
Course title	Human Computer Interaction
Weight	(2 Units C: LH 15; PH 45)
Learning Outcomes	At the end of this course, students should be able to: 1. discuss the foundations and concept of human-computer interface; 2. explain the 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 content	Foundations of HCI. 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.

Course code	CYS 212
Course title	Systems Analysis and Design
Weight	(3 Units E: LH 30; PH 45)
Learning Outcomes	At the end of this course, students should be able to: 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 content	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
Course code	CYS 202
Course title	Introduction to Cybersecurity
Weight	(2 Units C: LH 30)
Learning Outcomes	At the end of this course, students should be able to: 1. explain cybersecurity concepts, its methods, elements, and terminologies of cybersecurity, threat, attack, defence, and operations; 2. describe common cyber-attacks and threats, cybersecurity issues, challenges and proffered solutions, and build an enhanced view of main actors of cyberspace and cyber operations; 3. apply the techniques for identifying, detecting, and defending against cybersecurity

	threats, attacks and protecting information assets; 4. explain the impact of cybersecurity on civil and military institutions, privacy, business and government applications; 5. identify the methods and motives of cybersecurity incident perpetrators, and the countermeasures employed by organisations and agencies to prevent and detect those incidences and software application vulnerabilities; and 6. state the ethical obligations of security professionals, evaluate cybersecurity and national security strategies to the typologies of cyber-attacks that require policy tools and domestic response, and define the cybersecurity requirements and strategies evolving in the face of big risk.
Course content	Basic concepts: cyber, security, confidentiality, integrity, availability, authentication, access control, non-repudiation and fault-tolerant methodologies for implementing security, security policies, best current practices, testing security, and incident response, risk management, disaster recovery, access control, basic cryptography and software application vulnerabilities. Evolution of cyber-attacks. Operating system protection mechanisms, intrusion detection systems, basic formal models of security, cryptography, steganography, network and distributed system security, denial of service (and other) attack strategies, worms, viruses, transfer of funds/value across networks, electronic voting, secure applications, cybersecurity policy and guidelines. Government regulation of information technology. Main actors of cyberspace and cyber operations. Impact of cybersecurity on civil and military institutions, privacy, business and government applications; examination of the dimensions of networks, protocols, operating systems, and associated applications. Methods and motives of cybersecurity incident perpetrators, and the countermeasures employed by organisations and agencies to prevent and detect those incidences. Ethical obligations of security professionals. Trends and development in cybersecurity. Software application

	vulnerabilities. Evolution of cybersecurity and national security strategies, requirements to the typologies of cyber-attacks that require policy tools and domestic response. Cybersecurity strategies evolving in the face of big risk. Role of standards and frameworks.
Course code	COM 222
Course title	Introduction to Web Authoring
Weight	(2 Units E: LH 30)
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the fundamentals of web development and architecture. 2. Create and structure web content using HTML. 3. Apply styling and layout techniques using CSS. 4. Implement basic scripting and interactivity using JavaScript. 5. Design user-friendly and visually appealing web interfaces. 6. Develop responsive websites that adapt to various devices. 7. Utilize web authoring tools for efficient development. 8. Manage domain registration, hosting, and file transfer. 9. Adhere to best practices in web development for optimization and security. 10. Build a responsive website as a capstone project, demonstrating acquired skills.
Course content	Fundamentals of Web Development. HTML (Hypertext Markup Language). CSS (Cascading Style Sheets) JavaScript Basics. Web Design Principles. Responsive Web Design. Introduction to Web Authoring Tools. Web Hosting and Domain Management. Web Development Best Practices.

300 Level Courses

Course code	**COM 307**
Course title	**Principles of Database Systems**
Weight	**(3 Units C: LH 15; PH 45)**
Learning Outcomes	**At the end of this course, students should be able to:** **1. describe database systems concepts and design;** **2. explain database models and construction;** **3. explain database implementation with SQL; and** **4. describe database management and security.**
Course content	**Database concepts. File versus database systems, data models, ANSI/SPARC 3-level view of a database, and the relational database model and its advantages over older and even emerging models. Design concepts and implementation: entity relationship modelling. Normalisation of database tables, structured query language. Database design and implementation. Introduction to transaction management and concurrency control, distributed database management systems. Database privacy, security, failure and recovery. Some emerging topics in databases such**
Course code	**ENT 312**
Course title	**Venture Creation**
Weight	**(2 Units C: LH 15; PH 45)**
Learning Outcomes	At the end of this course, students, through case study and practical approaches, should be able to: 1. describe the key steps in venture creation; 2. spot opportunities in problems and in high potential sectors regardless of geographical

	location; 3. state how original products, ideas, and concepts are developed; 4. develop business concept for further incubation or pitching for funding; 5. identify key sources of entrepreneurial finance; 6. implement the requirements for establishing and managing micro and small enterprises; 7. conduct entrepreneurial marketing and e-commerce; 8. apply a wide variety of emerging technological solutions to entrepreneurship; and 9. appreciate why ventures fail due to lack of planning and poor implementation.

Course content	Opportunity Identification (Sources of business opportunities in Nigeria, Environmental scanning, Demand and supply gap/unmet needs/market gaps/market research, Unutilised resources, Social and climate conditions, and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, microfinance, personal savings, small business investment organisations, and business plan competition). Entrepreneurial marketing and e-commerce (Principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, e-commerce business models and successful e-commerce companies). Small business management/family business: Leadership & Management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business

	communication (Strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution, and emerging technologies, business applications of new technologies, digital business and e-commerce strategies).
Course code	DTS 303
Course title	Probability for Data Science
Weight	(3 Units C: LH 45)
Learning Outcomes	At the end of the course the students should be able to: 1. analyse and interpret real-world statistical events; 2. utilise various principles and concepts from the broad theory of probability and adjoining statistical and mathematical fields; 3. apply statistical principles and concepts to analyse data; and 4. analyse and interpret real-world statistical events by applying various principles and concepts from the broad theory of probability and adjoining statistical and mathematical fields.
Course content	Experiments, sample spaces, outcomes and events. Generation of Statistical events from set theory (Venn diagrams). Concepts and principles of Probability (probability axioms). Random variables. The Law of Total Probability, Bayes' Theorem, Independence. Permutation and Combination. Introduction to Probability and distribution functions. The probability density function. Basic distributions: Bernoulli Trials, Binomial, Hyper geometric, Poisson, and Normal. Exploratory data analysis. Combinatorial analysis.

	Probability models for the study of random phenomena in finite sample generating functions and its properties. Chebyshev's inequality and limit theorems in probability. Central limit theorem. Bivariate, marginal and conditional distributions. Variance and covariance. Probability mass function. Geometric distribution. Sampling with and without replacement. Hypergeometric distribution. Bounding probabilities, tail sum formula. Markov's inequality. The exponential distribution, moments, memoryless property, hazard function. Definition of a Markov chain and probability transition matrices. Equilibrium behaviour of Markov chains: computer demonstration and ergodic, limiting and stationary interpretations. Mean and variance of linear combination of two random variables. The joint Moment generating function (MGF) and MGF of the sum. Definition of absorbing Markov chains, structural results, hitting probabilities and expected hitting times.
Course code	DTS 301
Course title	Probability for Data Science
Weight	(3 Units C: LH 45)
Learning Outcomes	At the end of the course, the students should be able to: 1. identify ethical challenges and considerations when working with data of various sources, context, and compositions; and 2. contribute to global debates regarding best practices for handling sensitive data in a way that avoids harm to data subjects, while also not eroding the utilities that such data could present for various decision-making processes.
Course content	Legal and ethical consequences of applying Data Science. Current techniques such as Digital Data Repositories and Digital Object Identifiers as well as FAIR principles for Open Science, Open Data. Data ownership and transparency; privacy concerns and consent; and addressing unintended bias. Topics: Legal aspects of data ownership and privacy concerns, Data transparency, Ethical considerations for Data Science, Introduction to Data Repositories and Digital Object

	Identifiers, Introduction to Open Science, Open Data, and Introduction to FAIR data.
Course code	COM 301
Course title	Data & Computer Communications
Weight	(3 Units C: LH 30; PH 45)
Learning Outcomes	At the end of this course, students should 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.
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 transmission, asynchronous transmission, efficiency of 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 and dynamic Huffman coding. Local Area Networks: medium access control techniques – Ethernet, token bus and token ring; fibre distributed data interface, metropolitan area network. Peer-to-peer, Client Server. Client- Server Requirements: GUI design standards, interface independence, platform independence, transaction processing, connectivity, reliability, backup, and recovery mechanisms. Features and benefits of major recovery mechanisms. Network OS: (e.g., Novell NetWare, UNIX/LINUX, OS/2 & Windows NT). INTERNET: Definition, architecture, services, internet addressing. Internet protocol, IPv4, IPv6. Lab Work: Demonstration of simple communications networks. Illustration of applications at the various levels of the OSI model. Demonstration of different types of Local Area Networks (LANs).

	Illustration of Metropolitan Area Networks. Illustration of Error Detection and Error Correction techniques. Demonstration of Network Operating Systems.
Course code	INS 387
Course title	Applications in Information Security and Assurance
Weight	(2 Units 3 LH 30)
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the fundamental principles of information security and assurance. 2. Identify and analyze cybersecurity threats and vulnerabilities. 3. Implement network security measures and technologies. 4. Apply cryptographic techniques to secure information. 5. Design and manage access control and identity management systems. 6. Develop and implement security policies and procedures. 7. Utilize security technologies and tools effectively. 8. Implement security measures for web and mobile applications. 9. Ensure security in cloud computing environments. 10. Explore emerging technologies and their security implications.
Course content	Overview of Information Security and Assurance. Threats and Vulnerabilities. Network Security. Cryptography. Access Control and Identity Management. Security Policies and Procedures. Security Technologies. Web and Application Security. Mobile Security. Cloud Security. Emerging Technologies in Information Security.
Course code	
Course title	Database Security and Auditing
Weight	
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the fundamental principles of database security and auditing.

	2. Implement authentication and authorization mechanisms in database systems. 3. Apply encryption techniques to protect sensitive data in databases. 4. Configure and manage database auditing features effectively. 5. Implement best practices for securing databases and the underlying server environment. 6. Monitor and analyze database activities for security incidents. 7. Ensure compliance with regulatory standards in database security. 8. Conduct database security assessments and vulnerability scans. 9. Develop and implement incident response and recovery plans for database security incidents. 10. Implement database security in cloud environments.
Course content	Introduction to Database Security and Auditing. Database Authentication and Authorization. Encryption in Databases. Database Auditing Basics. Database Security Best Practices. Monitoring Database Activities. Security Compliance. Database Security Assessment. Incident Response and Recovery. Database Security in Cloud Environments. Advanced Database Auditing Techniques.
Course code	COM 305
Course title	Principles of Operating Systems
Weight	
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.
Course code	COM 311
Course title	Web Application Development
Weight	(2 Units C: LH 15; PH 45)
Learning Outcomes	At the end of the lecture, the students should be able to: 1. design and implement simple client-side and server-side web applications; 2. demonstrate hands-on skills in PHP and Python programming uses open-source software; 3. compare and contrast web programming with general-purpose programming; and 4. develop a fully functioning website and deploy it on a web server.
Course content	Introduction to framework-based web development using a contemporary language like PHP and ASP.net. Principles of web pages (dynamic and static) and website design. The tool used in web development. Client-side and server-side languages. Creation of interactive, dynamic websites using a common web architecture and object-based database access. Design, implementation, and testing of web-based applications including related software, databases, interfaces, and digital media. Standard object models, and the use of server-side programmes for database and file access; testing, software quality assurance; and the process of publishing Web sites. Hands-on PHP and Python programme using open-source software (Apache, PHP, Python, JavaScript, and MySQL). Programming for web development includes control structures, objects, functions, and the

	use of composite data types. Deploying dynamic content using JavaScript. Designing and developing dynamic web pages and creating, validating, transforming, and formatting data using PHP.
Course code	DTS 321
Course title	Biostatistics
Weight	
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the fundamental principles and scope of biostatistics. 2. Apply descriptive statistics to summarize and present health-related data. 3. Utilize probability concepts and distributions in health research. 4. Perform statistical inference, including hypothesis testing and confidence interval estimation. 5. Apply parametric and nonparametric tests for different types of health data. 6. Conduct regression analysis for modeling relationships between variables. 7. Perform survival analysis for time-to-event data in health studies. 8. Design and analyze experiments in health-related research. 9. Conduct meta-analysis of research studies in health. 10. Apply statistical methods in epidemiological research.
Course content	Introduction to Biostatistics. Descriptive Statistics in Biostatistics. Probability Distributions in Biostatistics. Statistical Inference. Parametric and Nonparametric Tests. Regression Analysis. Survival Analysis. Experimental Design in Biostatistics. Meta-Analysis in Health Research. Epidemiological Statistics. Bayesian Methods in Biostatistics.

Course code	DTS 302

Course title	Big Data Computing
Weight	(2 Units C: LH 15; PH 45)
Learning Outcomes	At the end of the course the students should 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 4. analyse Big Data contents.
Course content	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. Lab Work: Analysing Twitter Data using Spark and MongoDB. Learn Big Data analytics skills. Practical procedure for the crafting of an enterprise-scale cost-efficient Big Data and machine learning solution to uncover insights and value from data. Use the practical exercises to bridge the gap between the theoretical world of technology with the practical ground reality of building corporate Big Data and data science platforms. Hands-on exposure to Hadoop and Spark (or any of the BD tools), build machine learning dashboards using R and R Shiny, create web-based apps using NoSQL databases. Practical assignment of BD security.
Course code	DTS 304
Course title	Data Science Innovation and Entrepreneurship
Weight	(2 Units C: LH 15; PH 45)
Learning Outcomes	At the end of this course, students should be able to: 1. explain business models; 2. identify some entrepreneurial opportunities available in IT;

	3. describe business plan and business startup process; 4. explain business feasibility and strategy; 5. explain marketing strategies; and 6. discuss business ethics and legal issues.
Course content	Fundamental concepts of innovation, and business ideas in general. Product development. Business leadership. Digital marketing. Entrepreneurial opportunities in IT. Legal issues and Business ethics. New venture creation process. Business feasibility planning. Market research. Business strategy. Business models and Business plans. Technical presentations. Report on a successful entrepreneurial outfit.
Course code	SIW 300
Course title	SIWES II
Weight	(3 Units C: PH 135)
Learning Outcomes	At the end of the course, the students should be able to: 1. appreciate the realities of the computing industry beyond the walls of the University, through an attachment with an organisation in the computing industry; and 2. apply the skills and knowledge they acquired in class towards solving real problems in actual working environments.
Course content	Requires 3 months of Industrial Training after the completion of 300 Level. Students' experience will be documented and presented in a Seminar.
Course code	**GST 312**
Course title	**Peace and Conflict Resolution**
Weight	2 Units C LH 30

Learning Outcomes	On successful completion of this module, students will be able to; 1. Analyse the concepts of peace, conflict and security; 2. List major forms, types and root causes of conflict and violence; 3. Differentiate between conflict and terrorism; 4. Enumerate security and peace-building strategies; and 5. Describe the roles of international organisations, media and traditional institutions in peace-building 6. Explain the relationship between peace, conflict and security. 7. Analyse the different theories of conflict and conflict resolution. 8. Apply conflict resolution skills to real-world situations. 9. Evaluate the effectiveness of different peace-building strategies. 10. Develop a personal commitment to peace and conflict resolution.
Course content	Introduction To Peace And Conflict Resolution. Conflict Analysis. Causes & Types Of Conflict. Root Causes Of Conflict And Violence In Africa Selected Conflict Case Studies. Conflict Transformation. Humanitarian Intervention. Peace Mediation And Peacekeeping. Agents Of Conflict Resolution. Roles Of International Organisations In Conflict Resolution.
Course code	CYS 202
Course title	Introduction to Cyber Security
Weight	(2 Units C: LH 30)
Learning Outcomes	At the end of this course, students should be able to: 1. explain cybersecurity concepts, its methods, elements, and terminologies of cybersecurity, security, threat, attack, defence, and operations; 2. describe common cyber-attacks and threats, cybersecurity issues, challenges and proffered solutions, and build an enhanced view of main actors of cyberspace and cyber operations; 3. apply the techniques for identifying, detecting, and defending against cybersecurity threats, attacks and protecting information assets;

	4. explain the impact of cybersecurity on civil and military institutions, privacy, business and government applications; 5. identify the methods and motives of cybersecurity incident perpetrators, and the countermeasures employed by organisations and agencies to prevent and detect those incidences and software application vulnerabilities; and 6. state the ethical obligations of security professionals, evaluate cybersecurity and national security strategies to the typologies of cyber-attacks that require policy tools and domestic response, and define the cybersecurity requirements and strategies evolving in the face of big risk.
Course content	Introduction to Cybersecurity. Basic Cybersecurity Concepts. Cybersecurity Policies and Procedures. Cybersecurity Risk Management. Network Security. Systems Security. Cryptography. Emerging Cybersecurity Technologies. Cybersecurity Policy and Guidelines. Cybersecurity Ethics and Law.
Course code	INS 314
Course title	Information Security Management
Weight	
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the fundamental concepts and principles of information security management. 2. Develop, implement, and maintain effective information security policies and procedures. 3. Identify, assess, and manage information security risks within an organization. 4. Implement access control and identity management mechanisms for secure information systems.

	5. Design secure architectures and implement appropriate security controls. 6. Apply cryptographic techniques and encryption to protect sensitive information. 7. Develop and implement security awareness and training programs for organizational staff. 8. Establish and manage incident response processes to address security breaches. 9. Develop business continuity and disaster recovery plans for information security. 10. Ensure compliance with relevant laws, regulations, and standards in information security
Course content	Introduction to Information Security Management. Information Security Policies and Procedures. Risk Management in Information Security. Access Control and Identity Management. Security Architecture and Design. Cryptography and Encryption. Security Awareness and Training. Incident Response and Management. Business Continuity and Disaster Recovery. Compliance and Legal Aspects. Emerging Trends in Information Security.
Course code	DTS 328
Course title	Statistical Methods in Data Science
Weight	
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the foundational concepts of statistics in the context of data science. 2. Perform exploratory data analysis (EDA) and effectively visualize data. 3. Apply probability theory and probability distributions to analyze data patterns. 4. Conduct statistical inference, including hypothesis testing and constructing confidence intervals. 5. Build and interpret regression models for predictive analytics. 6. Conduct analysis of variance (ANOVA) and interpret the results.

	7. Apply non-parametric statistical tests to analyze data with non-normal distributions. 8. Understand and apply Bayesian statistical principles in data analysis. 9. Analyze time series data and make predictions using time series models. 10. Integrate statistical methods with machine learning algorithms. 11. Use the R programming language for statistical computing and data analysis.
Course content	Introduction to Statistics for Data Science. Exploratory Data Analysis (EDA). Probability Distributions. Statistical Inference. Regression Analysis. Analysis of Variance (ANOVA). Non-parametric Statistics. Bayesian Statistics. Time Series Analysis. Machine Learning and Statistical Techniques. Statistical Computing with R.
Course code	DTS 322
Course title	Financial Data Analytics
Weight	
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the fundamentals of financial data analytics and its applications in the financial industry. 2. Preprocess financial data, including cleaning, handling missing values, and normalizing features. 3. Perform exploratory data analysis (EDA) on financial datasets and identify patterns and trends. 4. Apply time series analysis techniques to model and forecast financial time series data. 5. Build predictive models for financial forecasting using regression and machine learning algorithms. 6. Understand the principles of portfolio analytics, including risk assessment and optimization.

	7. Detect and prevent fraud in financial transactions using data analytics techniques. 8. Analyze sentiment in financial data and its impact on market prediction.
Course content	Introduction to Financial Data Analytics. Data Preprocessing for Financial Data. Exploratory Data Analysis in Finance. Financial Time Series Analysis. Predictive Modeling in Finance. Portfolio Analytics. Fraud Detection in Finance. Sentiment Analysis in Finance. Blockchain and Cryptocurrency Analytics. Ethics and Regulation in Financial Data Analytics.
Course code	INS 316
Course title	Principles of information security
Weight	
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Define the principles and importance of information security in various contexts. 2. Establish and implement information security governance and risk management practices. 3. Design and manage access controls, identity management, and authentication mechanisms. 4. Implement network security measures, including firewalls, intrusion detection, and VPNs. 5. Understand security architecture, including secure system and application design principles. 6. Manage information security operations, incident response, and continuous improvement. 7. Implement physical and environmental security controls and practices.
Course content	Introduction to Information Security. Information Security Governance and Risk Management. Access Controls and Identity Management. Network Security. Security Architecture and Design. Information Security Operations. Physical and Environmental

	Security. Legal, Ethical, and Professional Issues in Information Security. Security Testing and Evaluation. Business Continuity and Disaster Recovery Planning. Security in the Cloud.

400 Level Courses

Course code	TRP 401
Course title	Technical Report Writing
Weight	(3 Units C: LH 45)
Learning Outcomes	At the end of this course, students should be able to: 1. describe research, types, approaches, significance of research, research methods, research process, criteria and strategy for good research; 2. discuss the principles of scientific research, scientific investigation, problem formulation, and technique of the research problem; 3. describe the various elicitation methods; 4. develop appropriate data collection instruments; 5. conduct the literature review process; and 6. prepare briefs as well as technical reports and know how to cite referenced works and prepare references and bibliography.
Course content	Foundations of Research. Types of Research. Research Approaches. Significance of Research. Research Methods versus Methodology. Research Process. Criteria and Strategy for Good Research. Principles of Scientific Research. Scientific investigation. Problem Formulation

	and Its Techniques. Developing Research Proposal and Research Plan. Formulation of Research Questions and Hypothesis Testing. Developing Research Proposal and Research Plan. Literature Review. Procedure for Reviewing Related Relevant Studies. Methods for Collection of Primary and Secondary Data. Elicitation Techniques - Questionnaires, Interviewing, Ethnography, etc. Guidelines for Constructing Data Instruments. Methods of AnalysingData in Computing and Related Disciplines.System Design: Architectural design, input design, process design, output design. Use case analysis, sequence diagram, activity diagram, deployment diagram, etc.Types of Reports. Technical Report Writing. Layout and Mechanics of Writing a Research Report. Standard Techniques for Research Documentation. Interpretation and Presentation of Results. How to Cite Referenced Works and Prepare References and Bibliography.
Course code	DTS 417
Course title	Project Management
Weight	(2 Units C: LH 30)
Learning Outcomes	At the end of this course, students should be able to: 1. describe project management planning; 2. describe project scheduling; 3. explain management of project resources; 4. discuss project procurement, monitoring and execution; and 5. explain project communication and time management.
Course content	Introduction to Project Management. The Project Management Lifecycle: Project management and systems development or acquisition. The project management context. Technology and techniques to support the project management lifecycle, and Project management processes. Managing Project Teams: Project team planning, motivating team members, Leadership, power and conflict in project teams, and managing global project teams. Managing project communication and enhancing team communication. Project Initiation and Planning. Managing Project Scope: Project initiation, how organisations choose projects, Activities, and Developing the project charter. Managing Project Scheduling: Common problems in

	project scheduling, and Techniques for project scheduling. Managing Project Resources: Types of resources (human, capital, time), and Techniques for managing resources. Project quality and tools to manage project quality. Managing project risk and tools for managing project risk. Managing Project Procurement: Alternatives to systems development, External acquisition, Outsourcing-domestic and offshore. Steps in the procurement process, and managing the procurement process. Project Execution, Control and Closure: Managing project execution, monitoring progress and managing change. Documentation and communication, and Common problems in project execution. Managing Project Control and Closure: Obtaining information, Cost control, Change control, administrative closure, Personnel closure, Contractual closure and Project auditing.
Course code	DTS 477
Course title	Design Project
Weight	(3 Units C: PH 135)
Learning Outcomes	At the end of this course, students should be able to: 1. identify a researchable project topic in Data Science; 2. search and review literature pertinent to identified problem statements; 3. acknowledge and reference sources of information used in the research report; 4. conceptualise and design a research methodology to address an identified problem; 5. determine tools for analysing data collected based on research objectives; 6. write a coherent proposal on the research project to be conducted; and 7. orally present the written project proposal.
Course content	An independent or group investigation of appropriate software, hardware, communication and networks or IT related problems in Data Science carried out under the supervision of a lecturer. Before

	registering, the student must submit a written proposal to the supervisor to review. The proposal should give a brief outline of the project, estimated schedule of completion, and computer resources needed.
Course code	DTS 401
Course title	Data Visualisation
Weight	(2 Units C: LH 15; PH 45)
Learning Outcomes	At the end of the course, the students should be able to: 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 content	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). Lab work: Practical experiments on different methods of presenting data for visualisation. Practice on how to use graphs, tables, images, and video on animation for data presentation.
Course code	INS 471
Course title	Advanced Databases
Weight	(2 Units C: LH 15; PH 45)

Learning Outcomes	At the end of this course, students should be able to: 1. explain the principles and best practices of managing data with efficiency and effectiveness; 2. demonstrate knowledge of SQL and NoSQL; 3. explain data warehouse concepts, methodologies and tools; and 4. explain data mining architecture and applications.
Course content	Rational Databases: Mapping conceptual schema to relational schema; Database Query Languages (SQL) and NoSQL, Concept of functional dependencies & multi-valued dependencies. Transaction processing; distributed databases, XML and semantic Web. Data warehousing. Introduction to data science. Introduction to Data Warehouse, OLTP Systems; Differences between OLTP Systems and Data Warehouse: Characteristics of Data Warehouse; Functionality of Data Warehouse: Advantages and Applications of Data Warehouse. Advantages, Applications: Top- Down and Bottom-Up Development Methodology: Tools for Data warehouse development: Data Warehouse Types. Introduction: Scope of Data Mining: What is Data Mining. How Data Mining Works, Predictive Modelling: Data Mining and Data Warehousing: Architecture for Data Mining: Profitable Applications: Data Mining Tools. Lab work: Practical exercises on basic R commands and data structures for manipulating data; how to read data from multiple formats in and out of R, using loops, conditional statements, and functions to automate common data management tasks. Exercises on how to clean and manage multiple complex datasets, manipulate textual data, basic web scraping techniques, for both standard web pages and the Twitter API. Work on techniques and hardware necessary to manage large datasets efficiently. Practical exercise on managing multiple data sets by example; working with text data; converting long- and wide-format data; and dealing with messy data. R Programming Fundamentals for data I/O and packages, looping and conditional statements, and functions.
Course code	COM 411
Course title	Distributed and Cloud Computing

Weight	
Learning Outcomes	At the end of this course, students should be able to: 1. review the concept of cloud, cloud computing, and benefits of the cloud and knowledge of cloud-enabling technologies, virtualisation and multi-tenanting; 2. describe cloud services and service-oriented architectures, and examine the cloud reference model and cloud service models such as IaaS, PaaS and SaaS; 3. state the cloud deployment models of Public, Private, Hybrid and Community clouds and express how to build a cloud, the open standards and open source cloud management tools, architectural best practices and how to design for the cloud; 4. discuss the security in the cloud and how to efficiently secure your cloud, security for cloud computing; 5. apply the economics of the cloud, costs and payment models, have knowledge of when to use the cloud, cloud strategy, standards and the future; 6. analyse data centres, servers, data storage, data centre networking and virtualisation, cloud cube model, cloud threats, threat mitigation, cloud and security risks, real world issues with cloud computing, and cloud security alliance; and 7. distinguish the National Institute of Standards and Technology, Information Assurance Framework, Cloud Audit, Cloud Management Audit/Assurance Programme, Cloud Business Continuity Planning for secured and effective management of the cloud.
Course content	Introduction to cloud computing, cloud computing vendors, cloud computing threats, cloud reference model. Cloud-enabling technologies. Services, Service-Oriented Architectures. Cloud

	service models. Cloud deployment models. Introduction to data centres: servers, data storage, networking and virtualisation. Data centre networking. Introduction to server virtualisation software: VMware VSphere. Virtual machine management: configuration, placement and resource allocation. Power efficiency in virtual data centres. Fault tolerance in virtual data centres. The cloud cube model and security for cloud computing. Security in the cloud. Cloud threats, threat mitigation and security risks. Real world issues with cloud computing. Cloud security alliance. National Institute of Standards and Technology, Information Assurance Framework. Cloud audit. Cloud management audit/assurance programme, Cloud business continuity planning. Building a cloud. Architectural best practices: Designing for the cloud. Economics of the cloud. Cloud strategy. Cloud standards and the future. Security of the cloud.
Course code	COM 421
Course title	Computer Graphics and Visualization
Weight	(3 Units E: PH 45)
Learning Outcomes	On completing this unit, you would be able to: 1. Explain the various application areas of computer graphics 2. Understand the elements of a Graphic system. 3. Explain Graphics processing unit and its various forms
Course content	Introduction to Computer Graphics and Animation. Transformations, Camera models, Rasterization and Mapping techniques. Hierarchical Modeling and Animation. Curves and surfaces, image and the human visual system. Ray tracing, illumination algorithms and GPGPU.

Course code	DTS 423
Course title	Machine Learning with Deep Learning
Weight	(3 Units E: LH 45)
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the fundamental principles and applications of machine learning and deep learning. 2. Implement and train neural networks for various tasks using TensorFlow and PyTorch. 3. Develop and deploy convolutional neural networks (CNNs) for image recognition. 4. Apply recurrent neural networks (RNNs) for sequential data analysis and natural language processing. 5. Create generative adversarial networks (GANs) for image generation and data synthesis. 6. Implement autoencoders and variational autoencoders (VAEs) for unsupervised learning tasks. 7. Apply transfer learning techniques and deploy deep learning models in real-world scenarios. 8. Recognize and address ethical considerations and bias in machine learning models. 9. Explore advanced topics such as reinforcement learning, quantum machine learning, and explainable AI. 10. Demonstrate practical skills through a capstone project, solving a real-world problem using deep learning techniques.
Course content	Introduction to Machine Learning. Convolutional Neural Networks (CNNs). Recurrent Neural Networks (RNNs). Generative Adversarial Networks (GANs). Autoencoders and Variational Autoencoders (VAEs). Transfer Learning and Model Deployment. Ethics and Bias in Machine Learning. Advanced Topics in Deep Learning.
Course code	INS 423
Course title	Information Technology and Business Analytics

Weight	(3 Units E: LH 45)
Learning Outcomes	1. Understand the role of information technology and business analytics in organizational strategy. 2. Analyze and design information systems to support business processes. 3. Apply business intelligence concepts and data warehousing techniques. 4. Utilize data analytics techniques for descriptive and predictive analysis. 5. Demonstrate proficiency in big data technologies and their applications. 6. Apply machine learning algorithms for business applications. 7. Analyze and optimize business processes using process analytics. 8. Design and implement decision support systems for organizational decision-making. 9. Apply business analytics in marketing and finance contexts. 10. Demonstrate practical skills through a capstone project focused on business analytics implementation.
Course content	Introduction to Information Technology and Business Analytics. Foundations of Information Systems. Business Intelligence and Data Warehousing. Data Analytics Techniques. Big Data Technologies. Machine Learning for Business. Business Process Analytics. Decision Support Systems. Business Analytics in Marketing and Finance.
Course code	INS 425
Course title	Database Administration
Weight	(3 Units E: LH 45)
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the fundamentals of Database Management Systems and their role in information management. 2. Design relational databases using Entity-Relationship modeling and normalization techniques.

	3. Write advanced SQL queries and utilize stored procedures for data manipulation. 4. Implement security measures and access controls for database protection. 5. Develop data backup and recovery strategies for database integrity and continuity. 6. Perform database performance tuning through optimization techniques. 7. Design and implement data warehousing solutions for business intelligence. 8. Evaluate and implement NoSQL databases based on specific use cases. 9. Understand the impact of cloud computing on database management and implement cloud database solutions. 10. Apply database administration skills through a capstone project focused on implementation, optimization, and security.
Course content	Introduction to Database Management Systems (DBMS). Relational Database Design. SQL and Database Querying. Database Security and Authorization. Data Backup and Recovery. Database Performance Tuning. Data Warehousing and Business Intelligence. NoSQL Databases. Cloud Database Management.
Course code	Design Project
Course title	DTS 479
Weight	
Learning Outcomes	At the end of this course, students should be able to: 1. demonstrate technical skills in Data Science; 2. demonstrate generic transferable skills such as communication and team work; 3. produce a technical report in the chosen project; 4. defend the written project report; and 5. appreciate the art of carrying out a full-fledged research.
Course content	This is a continuation of DTS 497. This contains the implementation and the evaluation of the project. A formal written report, chapters 4

	- 5 has to be approved by the supervisor. A final report comprising chapters 1 - 5 will be submitted to the department for final grading. An oral presentation is required.
Course code	DTS 422
Course title	Fundamentals of Data Mining
Weight	
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the fundamental concepts and goals of data mining. 2. Explore and prepare data for effective data mining processes. 3. Apply various data mining techniques, including classification and clustering algorithms. 4. Evaluate and validate data mining models using appropriate metrics. 5. Implement regression analysis for predictive modeling. 6. Perform time series analysis and forecasting using relevant techniques. 7. Apply text mining and sentiment analysis to extract insights from textual data. 8. Work with data mining in big data environments using distributed computing tools. 9. Address privacy and ethical considerations in data mining practices. 10. Execute a capstone project, applying data mining techniques to solve a real-world problem.
Course content	Introduction to Data Mining. Data Exploration and Preparation. Data Mining Techniques. Evaluation and Validation of Data Mining Models. Regression Analysis. Time Series Analysis. Text Mining and Sentiment Analysis. Data Mining in Big Data Environments. Privacy and Ethical Considerations in Data Mining.
Course code	COM 412
Course title	Data Mining

Weight	3 Units E LH 45
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Define the objectives and processes of data mining. 2. Explore and prepare data for effective mining. 3. Apply various data mining techniques for classification, clustering, and association. 4. Evaluate and validate data mining models using appropriate metrics. 5. Implement advanced data mining techniques, including ensemble methods and deep learning. 6. Analyze big data using distributed data mining architectures. 7. Apply data mining to real-world applications in different industries. 8. Understand ethical and legal considerations in data mining practices. 9. Utilize data mining tools and software for practical applications. 10. Develop and present a comprehensive capstone project applying data mining techniques.
Course content	Introduction to Data Mining. Data Exploration and Preparation. Data Mining Techniques. Evaluation and Validation. Advanced Data Mining Techniques. Big Data and Distributed Data Mining. Real-World Applications of Data Mining. Ethical and Legal Issues in Data Mining. Data Mining Tools and Software.
Course code	CYS 412
Course title	Deep and Dark Web Security
Weight	(2 Units 2: LH 30)
Learning Outcomes	At the end of this course, students should be able to: 1. review Deep and Dark web terminologies; 2. describe how to access the Deep web and the Dark web with complete ease and total security; 3. investigate advanced and famous websites located on the Hidden Web (Deep and Dark Web); 4. plan, trade, buy, sell as well as mining cryptocurrencies;

	5. discuss the dangers as well as precautions to be taken care of while surfing the Web, and how to use Darknet E-mail services; 6. appraise how to anonymously access the Darknet and TOR hidden services (onion services), and how to enter the dark web while staying safe and avoid the bad side of the dark web; and 7. report on the best sites to visit while on the Dark web and Deep web.
Course content	Dark web, deep web, clear net. Tor Onion, Silk Road. How to get on the dark web. Users of dark and deep web. Invisible Web Search Engines. Privacy and anonymity as core values of the darknet. Decentralisation on the dark web. Accessing the Deep web and the Dark web through the TOR browser. Web security. Cryptocurrencies. Overview on Dark Web and Deep Web. The Hidden side/area of the web. Deep/Dark Web Anonymity, TOR, Hidden services, TAILS, Web Security, Cryptocurrencies. Crypto Trading and Cryptomining. Cryptocurrencies, Anonymity & Security. How to install a VPN, and adequate browsers like Chrome, Opera, or Firefox with tracking technologies. How Does the Dark Web Work? Reasons for Accessing the Dark Web. Security issues of Dark and Deep web. How to use the Tor over VPN method - Session logs storage. Encryption of traffic. Protection against malicious Tor exit nodes. How to use Tor over VPN - bypass blocked Tor nodes, ISP visibility in accessing onion content, susceptible to end-to-end timing attacks. Tor alternatives such as I2P, Matrix.org, Orbot, Globus Secure Browser, Comodo Ice Dragon and FreeNet. Cons and Pros of Tor. Use of virtual machine software. Navigating the Dark Web. The Hidden Wiki as Wikipedia's evil twin. Search engines such as DuckDuckGo, Torch, the triple-W Virtual Library, Uncensored Hidden Wiki, and ParaZite. Commercial services. Email clients. Darknet version of social media and instant messaging - Zuckerberg's Facebook, BlackBook, Torbook, Campfire, MadIRC Chat Server. Safety on the dark web. Inside the dark and deep web. The Best Sites and Services on the Dark Web. Deep web radio. Benefits of Deep and Dark web. Cyber Threats and Dangers on the Deep/DarkWeb. How to fight hackers underground. Dark web and Deep web monitoring.

Course code	INS 422
Course title	Database Analysis and Design
Weight	(3 Units E:LH 45)
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand fundamental concepts and principles of database management. 2. Develop Entity-Relationship Diagrams (ERD) for conceptual database modeling. 3. Design and implement relational databases, ensuring normalization. 4. Use SQL for querying, updating, and managing relational databases. 5. Apply advanced database design techniques for complex scenarios. 6. Manage transactions and ensure data integrity in database systems. 7. Implement security measures and access controls in databases. 8. Explore data warehousing concepts and data mining techniques. 9. Perform database performance tuning and optimization. 10. Execute a comprehensive database design and implementation project, including documentation and presentation.
Course content	Introduction to Database Concepts. Entity-Relationship Modeling (ERD). Relational Database Design SQL for Database Design. Advanced Database Design Techniques. Transaction Management and Concurrency Control. Database Security and Integrity. Data Warehousing and Data Mining. Database Performance Tuning.
Course code	INS 424
Course title	Information Resource Management
Weight	(3 Units E:LH 45)

Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the fundamental concepts and principles of Information Resource Management. 2. Develop and implement information governance and compliance strategies. 3. Apply Information Lifecycle Management (ILM) principles to manage data effectively. 4. Implement and manage data and information security measures. 5. Design and implement Knowledge Management (KM) initiatives. 6. Evaluate and optimize information technology infrastructure for IRM. 7. Develop and implement enterprise information architectures. 8. Evaluate, select, and implement information systems and applications. 9. Develop and implement strategic plans for Information Resource Management. 10. Execute a comprehensive Information Resource Management implementation project, including documentation and presentation.
Course content	Introduction to Information Resource Management (IRM). Information Governance and Compliance. Information Lifecycle Management (ILM). Data and Information Security. Knowledge Management. Information Technology Infrastructure. Enterprise Information Architecture. Information Systems and Applications. Strategic Planning in Information Resource Management.
Course code	DTS 424
Course title	Statistical Computing with SAS and R
Weight	(3 Units E:LH 45)
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Demonstrate proficiency in SAS and R programming languages for statistical computing. 2. Manipulate and preprocess data using SAS and R. 3. Perform descriptive and inferential statistical analyses.

	4. Create advanced data visualizations and reports. 5. Conduct time series analysis and interpret results. 6. Analyze longitudinal data using mixed-effects models. 7. Apply survival analysis techniques to relevant data. 8. Understand and work with big data analytics using SAS and R. 9. Integrate statistical computing tools with big data platforms. 10. Execute a comprehensive statistical analysis project using SAS and R, including documentation and presentation.
Course content	Introduction to Statistical Computing. Basic Data Manipulation in SAS and R. Descriptive Statistics with SAS and R. Inferential Statistics with SAS and R. Advanced Data Visualization in SAS and R. Time Series Analysis. Longitudinal Data Analysis. Survival Analysis. Big Data Analytics with SAS and R.
Course code	INS 412
Course title	Ethics, Quality and Sustainability in Technological Environments
Weight	(2 Units E:LH 45)
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the ethical considerations and challenges in technological environments. 2. Implement quality assurance practices throughout the technological product lifecycle. 3. Evaluate the principles and practices of sustainable technology development. 4. Apply ethical decision-making frameworks to resolve dilemmas in tech environments. 5. Implement and comply with international quality standards and certifications. 6. Develop and implement Corporate Social Responsibility (CSR) strategies in technology. 7. Demonstrate ethical leadership in managing technology teams and projects. 8. Define and measure quality metrics and key performance indicators (KPIs) in technology.

	9. Design and develop sustainable technology solutions with a focus on environmental impact. 10. Integrate ethics, quality, and sustainability concepts in a comprehensive capstone project.
Course content	Introduction to Ethics in Technology. Understanding ethical considerations in technology. Quality Assurance in Technological Environments. Sustainable Technology Development. Ethical Decision-Making in Technology. Quality Standards and Certifications. Corporate Social Responsibility (CSR) in Technology. Ethical Leadership in Technology Management. Quality Metrics and Key Performance Indicators (KPIs). Sustainable Technology Practices. Capstone Project: Integrating Ethics, Quality, and Sustainability.
Course code	**BUA 412**
Course title	**Analysis for Business Decisons**
Weight	3 Units C LH 45
Learning Outcomes	At the end of this course, students should be able to: 1. explain the basic elements of decision analysis; 2. demonstrate an understanding of operational research approach to business decision; 3. apply optimization techniques to resource allocation; 4. explain the concept of inventory control; 5. illustrate the concept of project management; 6. use different or models to create and analyze the risk profile of a decision; 7. apply the knowledge of probability judgments to managerial decisions; and 8. apply the concept of simulation to business decision situations.
Course content	Elements of decision analysis. Types of decision situations. Decision trees. Operational Research approach to decision analysis. Systems and system analysis. Modelling in OR. simulation. Cases for OR analysis. Mathematical programming. Transportation model. Assignment model. Conflict analysis and game theory. Project

	management, and other OR models. Inventory replacement. Line balancing. Routing and sequencing.
Course code	**BUA 410**
Course title	**Management Information System**
Weight	2 Units C LH 30
Learning Outcomes	On the successful completion of this course, students should be able to: 1. explain the meaning of management information system; 2. describe the use and function of management information systems; 3. explain the strategic value of information systems in the organization; 4. demonstrate a basic understanding of MIS basics; and 5. identify the impact of information systems on the next generation of business enterprises.
Course content	Introduction to Management Information Systems. Fundamentals of data processing – brief history and conventional data processing methods. Manual methods and mechanized methods. Classification of systems and their relative merits. MIS basics – Hardware, software, networking, and security. Closed loop and open loop systems: Effect on time-lag. The total system approach and objectives. Total systems and subsystems. Information Systems and organization strategy. Information Systems development. Information Systems in society and the world.

12.0 Instructional Methods

The instructional method is through the online course materials and hardcopies distributed to students at the Study Centres. Online facilitation is done through Learners Management Systems LMS . Other online fora for instructional delivery include chat, synchronous and asynchronous methods of communication using the LCMS platform and other mobile technologies. The facilitators will be closely monitored by the Head of the Department, the Study Centre Director and Directorate of Learners Support Services DLSS staff to ensure the quality of the services being rendered to the students.

13.0 Quality Assurance

Subject to the Senate's recommendations, the process of developing and adapting all instructional items is seriously monitored internally, so as to ensure quality right from the onset. The instructional items to be developed are subjected to plagiarism checks by the university and they are developed and edited by experts with PhD as a minimum qualification. Besides the 5-year period for the review of instructional items is another opportunity for review as the need arises to ensure the quality of the programme. Facilitators for the various courses are carefully selected from sister Universities nationwide with a minimum qualification of PhD. Finally, the West Midlands Open University policy and procedures for internal course validation follow.

14.0 Evaluation

Evaluation of all the courses would consist of Tutor Marked Assignments
TMAs), Computer Marked Assignments CMA and End of Semester Examinations. The TMA and CMA known as Continuous Assessment CA constitutes 40% of the final score. The End of Semester Examination is 60%

15.1 Tutor-Marked Assessments

As part of the evaluation mechanism, each course would be provided with at least 3 TMAs to be used as part of Continuous Assessments for a course. To qualify to sit for examination therefore, each student must turn in the three TMAs for each of the courses.

15.2 End of Semester Examination

Each course will be examined at the end of the semester. Course lecturers are responsible for the provision of questions and question data banks in the Department. Lecturers of the Department who are experts in the various course areas are responsible for TMAs and final examination question setting using the in-house style provided by the University. Thereafter, the questions would be internally moderated by the HOD and other senior internal staff in the Department before the invitation is sent to an External Assessor for moderation. The external assessor is chosen from other tertiary institutions. Also, students' projects are moderated zonally using the Project Administration System
PAS .

15.0 Principal Officers of the University

Board Members

XXX

Management

Vice Chancellor - XXX

Registrar - XXX

Librarian - XXX

16.1 Staff of the Department

A. Teaching Staff

S/N	Name of Staff	Rank	Qualification/Specialization/Date Obtained	Role
1.	**Prof. ODUN-AYO Isaac Ayodeji**	Professor	PhD Computer Science University of Benin, Nigeria Year Awarded – 2014	HOD
2.	**Dr. Kayode Oshinubi**	Senior Lecturer	PhD Applied Mathematics University Grenoble Alpes, France Year Awarded - 2022	
3.	**Dr. OLUFEMI Tolulope Olushola**	Senior Lecturer	PhD Computer Science (Data Security Analytics) Lead City University, Ibadan Year Awarded – 2023	
4.	**Mr Ishaya Jeremiah Ayock**	Lecturer II	PhD (In view) Data Science (Applied Machine Learning) Stellenbosch University, South Africa. Mphil Scientific Computing and	

			Industrial Modeling. Kwame Nkrumah University of Science and Technology, Kumasi, Ghana. Year Awarded- 2022	
5.	**OGUNLEYE Timothy A.**	Lecturer II	Ph.D. In View Statistics University of Ilorin M.Sc. Statistics University of Ilorin, Nigeria, Year Awarded - 2014	
6.	**Mrs. JIMOH Ebunayo Rachael**	Lecturer II	PhD in view Computer Science University of Ilorin, Nigeria 2019 – Till Date MSc. Computer Science University of Ilorin, Nigeria Year Awarded - 2017	

B. Technical Staff

S/N	NAME	QUALIFICATION	SPECIALISATION	RANK

C. Administrative Staff

S/N	NAME	QUALIFICATION	RANK

16.0 Learners' Support

Similar to other students receiving tertiary education, students in Distance Education require various academic and administrative support services from the University. The existing academic support services are from the Directorate of Learner Support Services DLSS that currently coordinates various Study Centres, student Counsellors and Facilitators. The School of Computing on its own, takes steps to enhance Study facilitation by following up on facilities available for its courses in all Study Centres and employ more Facilitators as the need arises.

17.0 Recognition of the Programme

The B.Sc. in Data Science introduces students to a multifaceted approach to modern technology, encompassing various aspects of software development, system dynamics, and strategic problem-solving. This programme aims to cultivate adept professionals capable of addressing challenges in the ever-evolving digital landscape, including cybersecurity, data privacy, software vulnerabilities, and technological advancements. Our vision is to establish a world-class centre for Data Science education, providing high-quality undergraduate and postgraduate programmes that empower graduates to lead in the fast-paced and innovative technology industry with a focus on sustainable practices and ethical considerations. Through collaborative research and community engagement, we strive to make significant contributions to positive advancements in technology and its impact on society, paving the way for a prosperous and technologically-driven future.

18.0 Target Students

The B.Sc. in Data Science is designed to cater to a diverse range of candidates interested in exploring the exciting world of technology and computing. This comprehensive programme attracts a wide array of individuals, including high school graduates seeking to embark on a promising computing career, career changers from various fields, STEM enthusiasts with a passion for problem-solving, women looking to break into the tech

industry, aspiring entrepreneurs aiming to drive innovation, IT professionals seeking to advance their expertise, avid gamers and tech enthusiasts fascinated by game development and artificial intelligence, and lifelong learners with a curiosity for the latest technological advancements. The program's broad applications and constant evolution make it an appealing choice for those with a keen interest in acquiring academic and vocational qualifications in the realm of Data Science.

Given the high demand and interest in the B.Sc. Data Science program, prospective learners can look forward to a promising future of gaining extensive knowledge and honing their innate abilities in critical thinking and problem-solving within the realm of technology and computing. The curriculum is designed to equip graduates with the skills to analyse and address socio-economic, political, and developmental challenges. With a focus on fostering knowledge-based professionals, this programme is expected to significantly benefit graduates as they embark on rewarding careers in both the private and public sectors.

19.0 Conclusion

In conclusion, the Data Science program at West Midlands Open University strives to empower students with a robust skill set, encompassing the latest technologies, ethical considerations, and practical applications in the dynamic field of data science. Through a well-rounded curriculum, hands-on experiences, and collaboration with industry, our graduates emerge prepared to address complex challenges, contribute to technological innovation, and make meaningful impacts in diverse sectors. The program's commitment to interdisciplinary learning, research opportunities, and a forward-looking approach ensures that our students are well-equipped for success in the ever-evolving landscape of data science.