



**AFRICA CENTRE OF
EXCELLENCE ON TECHNOLOGY
ENHANCED LEARNING**



**NATIONAL OPEN
UNIVERSITY OF NIGERIA**

Postgraduate Student Handbook

(2019-2022)



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The handbook is designed for easy reference, and contains concise information on the Centre and Programmes. It is our hope and expectation that students of the ACETEL will find the handbook useful.

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GLOSSARY OF TERMS

VISION AND MISSION STATEMENTS OF THE NATIONAL OPEN UNIVERSITY OF NIGERIA

Vision Statement

To be regarded as the foremost University providing highly accessible and enhanced quality education anchored by social justice, equality and national cohesion through a comprehensive reach that transcends all barriers.

Mission Statement

To provide functional, cost effective, flexible learning which adds life-long value to quality education for all who seek knowledge.

ANTHEM

National Open University of Nigeria
Determined to be the foremost university in Nigeria
Providing highly accessible
And enhanced quality education
Anchored on social justice
Equity, equality and national cohesion

Come to NOUN
For functional, cost effective and flexible learning
That adds lifelong value
For all who yearn
For quality education
And for all who seek knowledge

**PHILOSOPHY, VISION AND MISSION STATEMENTS OF
AFRICA CENTRE OF EXCELLENCE ON TECHNOLOGY ENHANCED LEARNING
NATIONAL OPEN UNIVERSITY OF NIGERIA**

Philosophy

Leveraging on the affordances of technology to ensure digital literacy and enhance the quality of STEM education

Vision

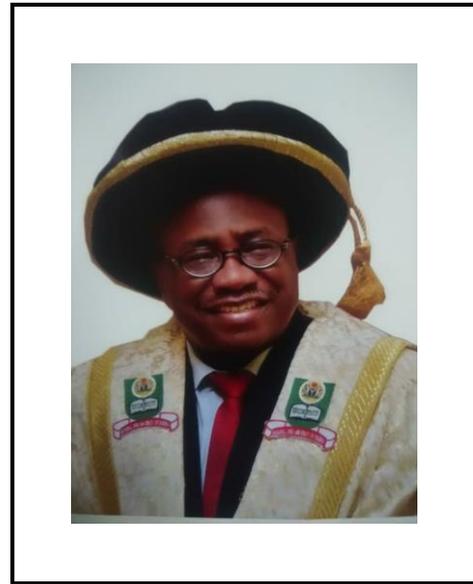
To be recognised for excellence in research and development of ICT digital solutions and their secure deployment for learning with application to all sectors

Mission

Development of digital expertise to drive economic growth and transformation in the West African sub-region and beyond

FOREWORD FROM THE VICE-CHANCELLOR

The National Open University of Nigeria, the only single mode open and distance learning institution in Nigeria and indeed in the West African sub-region has come a long way since its establishment in 2002. The University, which began with four Schools, has blossomed into its current number of eight Faculties. The institution prides itself in the uniqueness of its vision and mission – to be the foremost university that provides functional cost effective flexible learning which adds lifelong value to quality education for all who seek knowledge- and in implementing innovative methods that facilitate an enriching learning experience.



As it assiduously works towards the realisation of its vision and mission statements, NOUN continues to take great strides especially in using technology to make education accessible to millions of Nigerians, irrespective of age, gender, and employment status. To date, the institution has its automated admission, registration, continuous assessment, examinations, and is currently providing tutorial facilitation virtually.

It is on this premise the, University won the World Bank funded project of the Centre of Excellence on Technology Enhanced Learning (ACETEL). ACETEL runs six (6) academic programmes at Postgraduate level. These programmes focus on three Masters and three Ph. D. degrees in Cyber security, Artificial Intelligence and Management Information Systems. There are also Information technology skilled based short courses. Its programmes, academic staff, and graduates are among the best to develop digital tools in for education and research.

ACETEL handbook, which has been designed to meet international standards, complements the University's General Catalogue as a reference tool for information on matters specific to the Centre, its programmes, relevant policies, rules and procedures to guide students through the new experience of learning in ACETEL.

I urge every student of the Centre to read this handbook and make it a constant companion in order to get the best out of your learning experience at ACETEL. Welcome on board.

Professor Abdalla Uba Adamu
Vice-Chancellor

WELCOME FROM THE CENTRE DIRECTOR



Welcome to the Centre of Excellence on Technology Enhanced Learning (ACETEL). The Centre was launched at the Djibouti Workshop of World Bank and Association of African Universities (AAU) as one of the ACE Impact Project in February, 2019. The Centre offers six (6) programmes at the postgraduate level. They are M.Sc. Cyber Security, M.Sc. Management Information System, M.Sc. Artificial Intelligence, Ph.D. Cyber Security, Ph.D. Management Information System and Ph.D. Artificial Intelligence. We are pleased that all of these programmes have the approval of the National regulatory body, the National Universities Commission (NUC). In addition, the Centre will offer fourteen (14) short courses Digital Literacy, Cyber Security, Entrepreneurship, Leadership and Project Management, Learning Technology, Programming, English Language for Non English Speakers, Cloud Computing, Block Chain, Open Government Data, Data base management, Data analysis and Artificial Intelligence. Our students spans through all regions in Africa generally but West African sub-region specifically.

In the area of research, the African Centre of Excellence on Technology Enhanced Learning (ACETEL) focuses its research on digitalization of learning in postgraduate programmes using open and distance learning mode. The aim of research in the Centre is to examine the Information technology needs in the education space with application to public sector; and to develop digital software learning tools which will build digital capacity for learning, skill acquisition and research.

Our capacities lie the utilisation of computer professionals at the Department of Computer Science, Information, Communication and Technology (ICT) Unit, Management Information System (MIS) Unit and educational researchers from the Faculty of Education. Beside these academics and researchers, the Centre also collaborate with other professionals in the public sector and educational researchers in other universities in Nigeria and beyond.

In a knowledge economy, we remain committed to ensuring that we produce postgraduates that are highly valued by employers. By your enrolment in the Centre, you have become a member of this special extended community. Therefore, I encourage you to take advantage of this unique opportunity to equip yourself so that you can contribute and make a difference in the world. Please take some time to go through this student handbook. It contains important information about your programme and the degree requirements that you must fulfill to earn a postgraduate degree. Ultimately, it is your responsibility to ensure that you satisfy all the requirements for

your programme. In addition, the handbook also contains information about resources that are available at Centre such as library facilities, ICT, Virtual laboratory, recording studios and eLearning support, academic counseling services as well as University policies that will assist you as you navigate your learning experience. I encourage you to consult it regularly as a reference tool. Best wishes for a successful and fulfilling learning experience.

Prof. Grace E. Jokthan

Centre Director

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PART 1: INTRODUCTION

1.1 About the National Open University of Nigeria

The National Open University was first established on the 22nd July, 1983 by Act No. 6 of the National Assembly. It is the first and only single-mode university in Nigeria that is dedicated to the provision of higher education through the Open and Distance Learning (ODL) mode. Shortly after however, the National Open University Act of 1983 by which the University was established, was suspended on the 25th April 1984.

In the Nation's search of a means of providing education for all her citizens, a National Workshop on Distance Education held in September 2000 and it called for the development and implementation of a National Policy on Open and Distance Education, the use of Open and Distance Learning to train teachers, and the re-establishment of the National Open University. Thus, in response to this call and eighteen years after its suspension, the University was resuscitated as the National Open University of Nigeria (NOUN) on 1st October 2002.

NOUN operates the open and distance education system which the National Policy on Education describes as a system that encompasses education for all, education for life, Lifelong learning, and Self-learning among others. The rebirth of NOUN, which has served as a springboard for ODL in Nigeria, is a demonstration of the country's irrevocable and unwavering commitment to education as a tool for personal and national development, and as a fundamental human right of her citizens.

The University's overall goal is to make education available to all who have the ability, and are willing and ready to benefit from functional and quality education provided through flexible and affordable distance learning.

1.2 Studying through Open and Distance Learning at NOUN

Open and Distance Learning is a mode of learning that is characterised by the separation of the teacher in space and or time from the learner, and enables learners to exercise choice over their learning regarding what, how, where they learn, pace of learning, support for learning, when and where assessment of learning takes place. NOUN's approach to ODL has the following features:

Openness: Removal of all barriers or restrictions to learning that characterise traditional education. They include restrictions by age, course and programme duration, location of study, and entry qualifications or recognition of prior learning and cognate work experience.

Flexibility of learning: The emphasis is on learning rather than teaching. It is students' responsibility to choose how they want to study, learn anywhere, anytime, and at their

own pace mediated by technology. In other words, it is learner-centred rather than teacher-centred. Programmes can be completed up to double the normal duration of programmes.

Accessibility: Study Centres at state, community, and special (prison, paramilitary agencies and military units) levels to reach all segments, communities and individuals in the society who are committed to improving their circumstances through education including the disadvantaged and marginalised.

Affordability: Removal of financial barriers by allowing learners to pay as they study and by providing materials and other services on a cost recovery basis.

Multi-modal instructional delivery: Delivery methods using a variety of media and technologies that is most easily available to learners ranging from print, audio, video, radio, television, and the Internet (web-based instruction).

- Availability of course materials in Print, Compact Discs, eCourseware, and OER formats.
- NOUN's eLearning platform of Directorate of Learning Content Management System (DLCMS) has provision for video tutorial lectures, online discussion classes with facilitators and peers, and assessment quizzes and practice tests. The instructional mode of delivery and learning provides the opportunity for learners who are employed or self-employed to acquire knowledge, skills and techniques which may be relevant to their present work situation or to improve their academic qualifications for better career prospects, without leaving their current location. ACETEL keys into the operations of this Directorate to her students effective instructional delivery.

1.3 About the Africa Centre of Excellence on Technology Enhanced Learning (ACETEL)

The National Open University of Nigeria (NOUN) was established in 1983 as the only single mode open and distance learning (ODL) institution in Nigeria. The University has the mandate to deliver education to the door steps of Nigerians and beyond. To achieve this, the University must seek for and develop strategies that will improve the use of technology in the education space. This is due to the fact that the country and indeed Africa faces critical digital development challenges. The continent lacks a critical mass of skilled labour due to low access to, and high incidences of dropout from the formal education systems.

According to an African Developmental Bank (AfDB) report (2017), most African education systems are facing ‘a triple crisis – scarce human capital, low quality and poor inclusion, and a lack of alignment with private sector needs’. The report also notes that there are ‘too few scientists and engineers in sectors that drive African economic transformation’ highlighting a shortage of professionals in Science, Technology, Engineering, Mathematics (STEM) on the continent. STEM education has been directly linked to economic growth as they constitute the source of core critical skills needed to drive development. Africa, especially the West African sub-region, needs to do more to ensure the continent’s transformation in access to knowledge and the acquisition of critical skills needed for economic transformation.

The investment in research and development for leading the utilisation of technology in education and indeed all sectors is the focus of this project. In order to optimise the continent’s research, innovation and development potentials with respect to the application of technology in learning, the formation of an entity known as Africa Centre of Excellence on Technology Enhanced Learning (ACETEL) is being proposed. The Centre focuses on:

- i. Development of digital tools and solutions, skills in software development and mobile-based applications to build capacity in the region and increase access to education of the next generation of digital experts (researchers and professionals);
- ii. Development of digital policies to guide the development, use and regulation of IT tools that are underpinned by sound pedagogy and learner-centred design and its mainstreaming in the public sector;
- iii. Building capacity with a focus on development of 21st century skills to produce the next generation of digital experts (researchers and professionals) through technology-based postgraduate programmes, short courses and internships, and developing cyber security tools and training to create awareness so as to ensure protection from intruders and hackers in order to mitigate against cyber space risk such as privacy and online safety for children.

These strategies are expected to lead to the (a) development of virtual learning environment (VLE); (b) production of experts and skilled graduates in software research and development; (c) higher expertise on animation and digital simulations and interactive learning to make young graduates more suited to the demands of the labour market; (c) development of projects in fields

such as virtual labs, software applications, simulation and animation, in order to increase the technological readiness and enhance firm-level absorption of technologies.

The centre also facilitates the establishment of partnerships and linkages with the public and private sectors. These partners provides research opportunities, training, internship opportunities, to develop, adopt, and adapt technological tools for use in the education space and promote the mainstreaming of technology-based learning in the region. The expertise and facilities available at partner institutions are available to the Centre. A robust monitoring and evaluation mechanism that improves the Centre's management of outputs, outcomes and impact are integrated into the Centre's activities. These strategies are expected to increase digital literacy and enhance subscription to STEM education leading to economic development in the sub-region.

In order to optimise the continent's research and innovation potential towards building the next generation of digital experts (researchers and professionals), the Centre focuses on the following:

- Achieve distinction in research and build capacity to address social and economic development in the region through training and improving skills of researchers in the development of digital tools, solutions, and skills in software development and mobile-based applications;
- Stimulate academic-industry collaboration in development of IT tools that are underpinned by sound pedagogy and learner-centred design principles;
- Stimulate specialisation and competencies in the higher education system and build capacity with a focus on development of 21st century skills through technology-based postgraduate programmes, short courses and internships;
- Stimulate research and networks on digital policy issues on the use and regulation of digital technologies and their mainstreaming in the public sector; and
- Develop cyber security tools and training to mitigate cyber space risks and promote cyber security.

EXPECTED OUTCOMES

The expected outcomes of the Centre include:

1. Partnerships and linkages with collaborating institutions in public and private sectors that will increase digital literacy and enhance quality of STEM
2. A developed resource Centre for e-learning strategies and Virtual Learning Environment (VLE);
3. Digital experts and skilled graduates in software research and development, animation and digital simulations and interactive learning for graduate employability;
4. Investment in research and development projects in fields such as virtual laboratories, software applications, simulation and animation to increase technological readiness enhance firm-level technological absorption;

5. Provision of safe and secure digital environment and tools for conduct of online activities;
6. Curricula that integrate pedagogical and instructional design that is learner-centred and enhances learning, research and applied development in Africa;
7. Postgraduate programmes, short courses and facilitate workshops, seminars and internships, that will build capacity for technology innovation and improve technology-enhanced learning;
8. Increased access and subscription to STEM for improved performance;
9. Engagement with stakeholders in a consultative forum for the establishment of procedures leading to enactment of digital policies to ensure smart societies, digital governance and sustainable digital economies.

NOUN, by virtue of its operations, leverages extensively on external expertise. Similarly, the Centre will identify and constitute from among its Partners a team of technical consultants to guide on technological issues. The centre will engage users, regional and national academic partners, industry and policy partners in the identification of gaps in capacity, research topics, and needed solutions through stakeholder workshops as well as in testing, dissemination and up scaling of digital solutions. It will also disseminate its research findings and ICT solutions through conferences, workshops and staff/student exchanges, as well as the uptake of its ICT solutions and tools for the education and public-private sector, through its industry, and institutional partners and networks.

1.4 Academic Programmes

ACETEL has 6 postgraduate programmes comprising 3 Masters programmes and 3 Ph. D. programmes.

The programmes are each coordinated by a Centre Leader, Academic Programme Coordinator, Academic staff members from the Faculty, Institutional and Sectoral Partners. The programmes are:

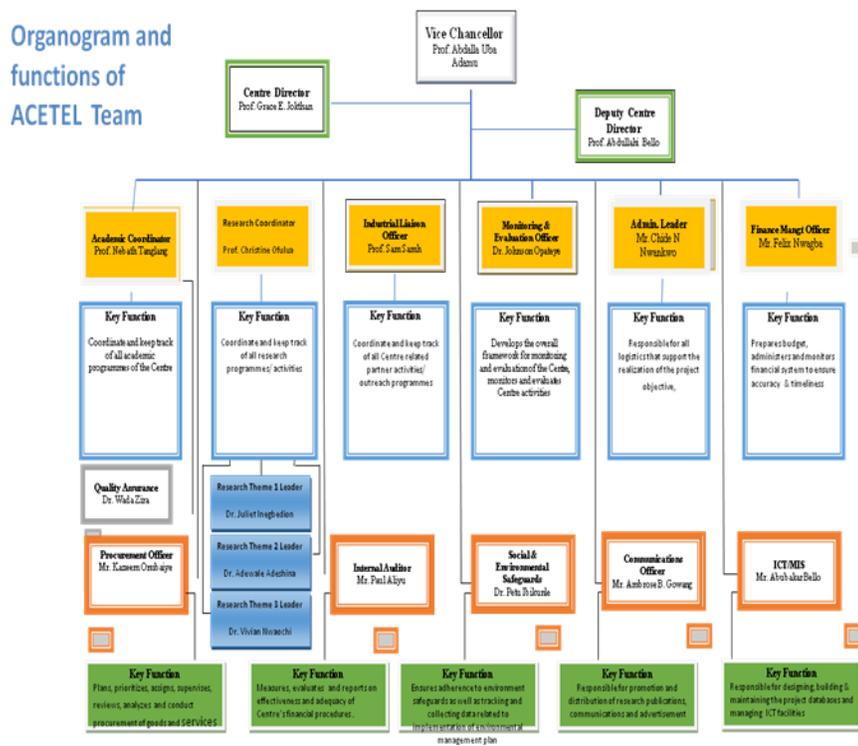
- i. M.Sc. Artificial Intelligence
- ii. M.Sc. Cyber Security
- iii. M.Sc. Management Information System
- iv. Ph.D. Artificial Intelligence
- v. Ph.D. Cyber Security
- vi. Ph.D. Management Information System

1.5 Administration

The Office of the Centre Leader/Director is responsible for the overall administration of the Centre. The Centre is headed by a Centre Leader who is assisted by other Coordinators.

For a list of current staff and their areas of responsibilities see appendix I or visit the Centre’s webpage on the University’s website www.acetel@noun.edu.ng.

Figure 1 illustrates the Centre’s organisational structure:



6 Orientation Programme

Orientation programmes are organised for new students at the beginning of every academic semester during which you are familiarized with ACETEL and Open and Distance Learning (ODL) operations. The orientation programme takes place via virtual link at the various places where local and regional situated. The programme also gives you the opportunity to learn about the various facilities and support services that will enhance your learning such as first contact points at ACETEL, selection and registration of courses, information, guidance and counseling services, and use of ICT facilities. You will also have the opportunity to ask questions. You will receive information about the orientation programme through an SMS and email messages. You are advised to attend the orientation programme as it will assist you to commence your programme on good footing.

PART 2: PROGRAMME AND DEGREE AWARD REQUIREMENTS

4.0 Introduction

This section contains information on all you need to know about your programme requirements, registration, courses, research projects, industrial attachment, and plagiarism. You will also learn how to calculate your final grades.

4.1 Programme Duration

Masters programmes in ACETEL are for a minimum of four (4) and maximum of eight (8) semesters. For Ph. D. Programmes, a minimum of six (6) and maximum of twelve (12) semesters are required.

4.2 Course Registration

Course registration is done online on the University's registration portal at www.acetelnou.edu.ng. Students are expected to register for courses after they must have completed payments for the semester.

The course registration portal contains the list of all courses offered in each programme. Students are expected to register for a minimum of 10 credit units and a maximum of 20 credit units per semester and which must include a minimum of one (1) elective course per semester. Students are allowed to register for a maximum of 24 credit units where they have carried over courses failed from a previous semester.

4.2.1 Prerequisite Course

Some courses have prerequisites which are courses you must complete and pass before you can register for those courses. You will not be allowed to register for a course whose prerequisite course you have not passed and awarded the credit units.

4.2.2 Registration procedure

Students are required to visit the course registration portal at www.acetelnoun.edu.ng, and follow the instructions provided for registration. Upon completion of the exercise, you should print and keep a copy of the printout of your registered courses for your records and for clearance during end-of- semester examinations. Registration is activated only if there are sufficient funds in your e-wallet to cover the cost of the courses registered.

4.2.3. Opening and Closing of the Course Registration portal

The registration portal opens at the beginning of every semester and closes before the commencement of continuous assessment. Once the portal is closed, you will not be able to register for courses for the semester until it opens again for the next semester. This means that students who were unable to register for their courses before the closure of the course registration portal are **Not Eligible** to take the TMA and examinations for the course(s).

4.3 Course re-registration

You are not allowed to re-register for a course that you have already passed.

4.4 Add and/or Drop courses

The ACETEL course registration portal makes provision for students to drop and add courses. To add or drop a course, visit the Course Registration portal and follow the instructions at www.acetelnoun.edu.ng. You should ensure that you add or drop courses before the course registration portal is closed.

4.5 Eligibility for Graduation

Each postgraduate programme has its own requirement for graduation. See those requirements under each programme below.

4.7 Research Projects

The research project is one of the requirements for the award of M. Sc. or Ph.D. degrees in ACETEL. It is a compulsory course of 6 credit units for which M. Sc. students must be duly registered in the third semester of their programme duration and 12 credit units for Ph. D. students. It is a long essay that involves research to be conducted on a topic that is approved by the Centre. The Project shall be written under the supervision of a subject matter expert that is either an academic staff in the Centre or a tutorial facilitator.

4.8 Grading, Moderation and Mode of Submission of Projects

Projects are submitted directly to the Centre and are graded by the project supervisor, and subjected to internal and external moderation in the Centre. All Ph. D. projects would be subjected to external defense by an appointed Professor on the area of specialization the project is addressing.

4.8.1 Grading System

Courses and Research Projects are graded as follows:

Score	Grade	Point
70 and above	A	5
60 – 69	B	4
50 – 59	C	3
0 - 49	F	0

4.7.2 Mode of Submission of Projects

There are guidelines for the submission of projects in ACETEL which students must comply with before a project is accepted by the Centre. All projects (whether Masters or Ph. D.) shall be printed and approved in line with the guidelines as specified for projects in the National Open University. Students are to submit 4 bounded copies of their research project, along with soft copies of the project in two (2) Compact Discs (CDs) to ACETEL.

Note: The research project must be passed to be eligible for graduation.

4.8 Industrial Attachment/Student Industrial Workplace Scheme (IT/SIWES)
All Masters students are expected to participate in at least six (6) weeks field attachment training before the end of the programme. It is a compulsory 6- credit unit course that must be passed to be eligible for graduation. The industrial attachment training must be carried out in a workplace that is relevant to students' discipline. Field supervisors shall be assigned to you to monitor and assess your' activities during the period of their attachment. Grading of the course is the same as for other courses and project (see Appendix III for information on Programme requirements for the IT/SIWES).

4.9 University Policies

4.9.1 ACETEL Copyright Policy

ACETEL adopts the university copyright policy to protect the Centre's research works. Portions taken from the institution's course materials should be properly acknowledged and not used for commercial purposes. Students must also respect copyrights of non-institutions materials such as text books, research projects, images, audio or video materials by properly acknowledging the source and the author. Students are liable to violating owner's copyright through acts of plagiarism and piracy.

4.9.2 Plagiarism

Plagiarism is defined as 'the practice of taking someone else's work or ideas and passing them off as one's own' (Oxford Dictionary.com). Plagiarism is a serious crime and is an infringement of the rights of the copyright owner. It is an act of academic dishonesty to take ideas or work that was not originally one's own and present it as one's own ideas or your work and use it without proper acknowledgement of the source and author.

Examples of Plagiarism and the infringement of copyright owner's rights may include the following:

- Failure to obtain permission for the use of portions longer than a paragraph or to acknowledge the source and the name of the author from where sentences or passages not longer than a paragraph, figures, pictures have been taken and used word-for word;

- Paraphrasing of the ideas or works of others including those obtained from the Internet without acknowledging the source and the author of the work;
- Reproduction and sale of the institution's course materials is an act of piracy;
- Copying of another student's assignment and submitting it as one's own work; and
- Paying someone to do an assignment on one's behalf and submitting it as one's own work.

To avoid being guilty of copyright violations, students must ensure that they do the following:

- Cite all sources and names of authors from which information was obtained and used;
- Obtain permission for the use of materials that are longer than a paragraph; and
- Comply with the University's copyright policy.

Students are encouraged to avoid acts of plagiarism and other dishonest acts by learning to properly cite and acknowledge sources from which they have taken materials for their research or assignment.

4.10 Degree Award Requirements

4.10.1 Compulsory and Elective Courses

Programmes in ACETEL comprise courses that are either compulsory or electives. Compulsory courses are core courses that must be passed to be eligible for graduation. Elective courses are courses that are optional in terms of the number that students must register for and pass per semester. Compulsory courses and elective courses are programme-specific (see appendix IV for list of courses). For a detailed description of courses visit the Centre's web page at www.acetelnu.edu.ng.

4.10.2 Minimum course credits for graduation

Students must pass all compulsory courses and a minimum of one (1) elective course per semester.

4.10.3 General Studies Courses (GST)

General Studies courses are designed to produce well-rounded, morally and intellectually capable graduates that: are equipped with digital skills to navigate through the ICT age; are capable of communicating effectively; have with the capacity to appreciate and promote peaceful co-existence; have a broad knowledge of the Nigerian people for mutual understanding; and are independent critical thinkers capable of growing successful entrepreneurial endeavours.

General courses are compulsory courses that must be registered for and passed, in addition to the Programme's core compulsory and elective courses. Table 1 presents the general courses for the Africa Centre of Excellence on Technology and Enhanced Learning:

Table 1. Compulsory General courses for Programmes in ACETEL

LEVEL OF STUDY	COURSE CODE	COURSE TITLE	CREDIT UNIT
Masters	GST807	Study Guide for Distance Learners	2
Ph. D.	GST907	Study Guide for Distance Learners	2

2.1 Degree award requirements

1 Masters Degrees

2.1.1 Name of the Programme: Master of Science (MSc.) Artificial Intelligence

1.1 Programme Code: 5413

2.0 Entry Requirements

To be admitted into the MSc. Artificial Intelligence programme, a Candidate is expected to fulfill the following requirements:

- A Bachelor's Degree with a minimum of Second Class Upper in a computer related degree or Mathematics, Physics, Engineering or other degrees with substantial mathematics content. OR

A minimum of 3.5-points at the PGD level in a computer related degree E.g. Computer Science, Computer Engineering, Information Technology.

Note: For candidates from Physics, Mathematics, Statistics and Engineering (except Computer and Electrical/ Electronics Engineering), a PGD can serve as a bridge Course to qualify for admission into MSc AI.

➤ Candidates are expected to have taken the following background (or their equivalents) courses:

- i) Algorithms (ATI823)-Programming, Algorithm design and analysis.
- ii) Basic probability, statistics and algebra (ATI821)-Linear algebra and Discrete Math.

➤ In addition, candidates must possess a minimum of five credits in SSCE/GCE/NECO/NABTEB or its equivalent, at not more than two (2) sittings, in the following subjects: English Language, Mathematics, Physics, Chemistry, Biology or Further Mathematics.

2.1 Duration of Programs

The programme minimum duration is 3 semesters and the maximum is 6 semesters.

2.2 Graduation requirements

- i. The student must earn a minimum of 45 credit units to graduate as follows:
Core courses=39 credit units including dissertation

Elective courses= 6 credit units electives
- ii. The student must present two seminars before the final defense
- iii. The student is expected to publish in acceptable peer reviewed conference proceedings /journal
- iv. The minimum CGPA to proceed to dissertation is 3.00 and the minimum graduation CGPA is 3.00

3.0 Aim and Objectives

Artificial Intelligence (AI) tackles complex real-world problems including web search, face and speech recognition, machine translation, autonomous driving, and automatic scheduling with rigorous mathematical tools. In this course, you will learn the foundational principles that drive these applications and practice implementing some of these systems.

3.1 Aim

The MSc. Artificial Intelligence programme aims to provide high quality education and skills relevant to research and industry application in AI, in Africa and internationally.

3.2 Objectives

The programme is geared towards familiarizing graduates on core areas of Artificial Intelligence and their applications with a view to acquiring the basic skills required for advanced postgraduate studies and research. The main goal of the course is to equip you with the tools to understand and implement AI. On successful completion of the MSc. in Artificial Intelligence, graduates will be:

- Equipped with an understanding of the fundamental approaches to implementing intelligent behavior in machines;
- Equipped to produce computer applications that appropriate Artificial Intelligence (AI);
- Able to develop frameworks and design solutions to problems that are uniquely African and hence may not be adequately addressed by imported Artificial Intelligence (AI) technology;
- Provided with sufficient awareness of the importance of Data analysis, how to accumulate data, process and make productive inferences from it.

4.0 Programme Structure and Degree Rules

4.1 Outline of Course Structure

Courses

S/N	Course Code	Course Title	Credit Unit	Status
1	ATI801	Principles and Techniques of Artificial Intelligence	3	C
2	ATI802	Natural Language Processing	3	C
3	ATI803	Programming for artificial Intelligence	3	C
4	ATI804	Machine Learning II	3	C
5	ATI805	Machine Learning I	3	C
6	ATI806	Introduction to Robotics	3	C
7	ATI808	Probability and Statistics	3	C
8	ATI810	Seminar	2	C
9	GST809	Good Study Guide	2	C
10	ATI899	Dissertation	6	C
11	SCI801	Management and Entrepreneurship	2	C
12	SCI802	ICT and Research Methodologies	2	C
13	SCI803	Emerging Technologies	2	C
14	SCI804	Science, Environment and Innovation	2	C
15	ATI821	Basic Probability, Statistics and Algebra	2	E
16	ATI822	Computational Logic	2	E
17	ATI823	Introduction to Algorithms	2	E
18	MIS 804	Data Warehousing and Analytics	2	E
19	MIS 807	Innovation Management and Organizational Change	2	E
20	CST802	Malware and Digital Forensics	3	E
21	CST807	Secure Software Engineering	2	E

The MSc. Artificial Intelligence programme is structured into 3 semesters as presented in the tables shown below:

1ST SEMESTER

Course Code	Course Title	Credit Unit	Status
ATI801	Principles and Techniques of Artificial Intelligence:	3	C
ATI803	Programming for Artificial Intelligence	3	C
ATI805	Machine Learning I	3	C
SCI801	Management and Entrepreneurship	2	C
SCI803	Emerging Technologies	2	C
GST807	Study Guide for Distance Learning	2	C
	*Students are required to take two electives	4	E
Total		19	

ELECTIVES- 1ST SEMESTER

Course Code	Course Title	Credit Unit	Status
ATI821	Basic Probability, Statistics and Algebra	2	E
ATI823	Introduction to Algorithms	2	E

MIS 807	Innovation Management and Organizational Change	2	E
CST807	Secure Software Engineering	2	E

2nd SEMESTER

Course Code	Course Title	Credit Unit	Status
ATI802	Natural Language Processing	3	C
ATI804	Machine Learning II	3	C
ATI806	Introduction to Robotics	3	C
ATI808	Probability and Statistics	3	C
ATI810	Seminar	2	C
SCI802	ICT and Research Methodologies	2	C
SCI 804	Science, Environment and Innovation	2	C
	*Students are required to offer one elective	2	E
Total		20	

ELECTIVES- 2nd SEMESTER

Course Code	Course Title	Credit Unit	Status
ATI822	Computational Logic	2	E
MIS 804	Data Warehousing and Analytics	2	E
CST802	Malware and Digital Forensics	3	E

3rd SEMESTER

Course Code	Course Title	Credit Unit	Status
ATI899	Dissertation	6	C
Total		6	

Total Core (15+18+6=39) **Total Elective** (4+2=6)

All students of the MSc. Artificial Intelligence programme are required to obtain a minimum of 45 credit units.

DETAILED COURSE CONTENT SPECIFICATION

ATI801: Principles and Techniques of AI (3 Units)

This introductory course exposes the student to the fundamentals of AI including the scope and limitation of the algorithmic approach to problem solving giving a broad overview of modern artificial intelligence. The course also explores several applications of AI and discusses related field such as big data and internet of things. Specific topics include search, game playing, Markov decision processes, constraint satisfaction, graphical models and logic, Knowledge Representation and Reasoning, Ethics, Privacy, Artificial Intelligence in Society.

Recommended reading:

- Russell & Norvig, *Artificial Intelligence: A Modern Approach*, Prentice Hall, 3rd edition
- Amit Konar, *Artificial Intelligence and Soft Computing*

ATI802: Natural Language Processing (3 Units)

This course provides the fundamental concepts and ideas in Natural Language Processing (NLP), an understanding of both the algorithms available for processing linguistic information and the underlying computational properties of natural languages. The course progresses from word-level and syntactic processing to question answering and machine translation. *Topics to be covered include;* Computational properties of natural languages; Co-reference, question answering, and machine translation; Processing linguistic information; Syntactic and semantic processing; Modern quantitative techniques in NLP; Neural network models for language understanding tasks.

Recommended reading:

- Uri Wilensky, *Introduction to agent-based Modeling: Modeling natural, social and engineered complex systems with NetLogo*, MIT Press
- ANSI Common Lisp Book
- Paul Graham, *ANSI Common Lisp*, Pearson/Prentice-Hall

Software:

- IBM Watson Tone Analyzer
- Microsoft Language Understanding Intelligent Service (LUIS)
- Google Cloud Natural Language
- Merlin

ATI803 Programming for Artificial Intelligence (3 Units)

This course develop students skills in using the Python Programming language to implement algorithms that manifest intelligence behavior. The basics of Python programming as expressed in iteration and recursion over variables, lists and tuples within modules and functions will be reviewed. Reading from and writing to files via File I/O syntax will also be explained. The principles of Object Oriented Programming (OOP) as expressed in encapsulation, composition, inheritance delegation and polymorphism will be introduced. Finally, Python libraries for Scientific Computing in general such as NumPy, Scikit-learn, iPython Notebook and Matplotlib and specific AI libraries such as TensorFlow and NLTK will be taught.

Recommended reading:

- Ahmed Ph. Abbasi , *Python Machine Learning*
- Francois Chollet, *Deep Learning with Python*

ATI808: Probability and Statistics (3 Units)

This course presents important probabilistic modeling languages for representing complex domains and how the graphic models extend to decision making. Use ideas from discrete data structures in computer science to efficiently encode and manipulate probability distributions over high-dimensional spaces. Apply and learn how to construct Probabilistic Graphical Model representation, using both human knowledge and machine learning techniques for good decision making under uncertainty.

Recommended reading:

- William Feller, *Introduction to Probability theory and application*
- Trevor Hastie, Robert Tibshirani & Jerome Friedman, *The Elements of Statistical Learning: Data Mining, Inference, and Prediction*, Second Edition Springer Series in Statistics

ATI804: Machine Learning II (3 Units)

This course will provide you with (i) the foundations of Deep Learning, understand how to build neural networks; (ii) a solid introduction to the field of RL, the core challenges and approaches in the field, including generalization and exploration. And learn how to lead successful machine learning projects. You will learn about Convolutional networks, RNNs, LSTM, Adam, Dropout, BatchNorm, Xavier/He initialization, and more. *Topics to be covered include;* Foundations of neural networks and deep learning: Techniques to improve neural networks: regularization and optimizations and deep learning frameworks; Convolutional Neural Networks and its applications (e.g. object classification, object detection, face verification, style transfer); Recurrent Neural Networks and its applications (e.g. natural language processing, speech recognition).

Recommended reading:

- Ian Goodfellow, Yoshua Bengio & Aaron Courville, *Deep Learning*
- M. T. Hagan, H. B. Demuth, M. H. Beale, O. D. Jesus, *Neural Network Design*, 2nd Edition. A PDF version of the textbook can be downloaded FREE from <http://hagan.okstate.edu/NNDesign.pdf>
- Jeremy Watt, Reza Borhani & Aggelos K. Katsaggelos, *Machine Learning Refined: Foundations, Algorithms, and Applications*, 1st Edition

Lab:

Learning the usage and real world applications of the software below

- TensorFlow
- Keras
- Neural Designer
- Deep Learning Studio

ATI805: Machine Learning I (3 Units)

This course provides a broad introduction to machine learning, data mining and statistical pattern recognition. It will also discuss recent applications of machine learning such as robotics control, autonomous navigation, bioinformatics, text and web processing and speech recognition. *Topics to be covered include;* Learning theory; Basics concepts of machine learning; Generative learning algorithms; Evaluating and debugging learning algorithms; Bias/variance tradeoff and VC dimension; Value and policy iteration; Q-learning and value function approximation.

Recommended reading:

- Ian Goodfellow, Yoshua Bengio & Aaron Courville, *Deep Learning*
- Christopher M. Bishop, *Pattern Recognition and Machine Learning*
- Tom M. Mitchell, *Machine Learning*
- Patrick Hebron, *Machine Learning for Designers*

Lab:

Learn the essential foundations of AI: the programming tools (Python, NumPy, PyTorch), the math (calculus and linear algebra), and the key techniques of neural networks (gradient descent and backpropagation).

ATI806: Introduction to Robotics (3 Units)

This course introduces students to robotic design and autonomous agents through the integration of mechanical devices, sensors and intelligent agents. Students will explore the application of intelligence in the control of motion. They will be exposed to such topics as Spatial descriptions, Kinematics, Statics and Dynamics. In addition they will study Motion Planning and Control, Trajectory Generation, Active Modelling and Simulation.

Recommended reading:

- Maja J. Mataric, *The Robotics Primer*, MIT Press 2007.
- Saeed Niku, *Introduction to Robotics: Analysis, Systems, Applications*, Prentice Hall, 2002.
- Siegwart and Nourbakhsh, *Introduction to Autonomous Mobile Robots*, The MIT Press, 2004.

SCI801: Management and Entrepreneurship (2 Units)

The course will cover business environment, general management, financial management, entrepreneurship development, feasibility studies, marketing and managerial problem solving.

SCI803: Emerging Technologies (2 Units)

Nanotechnology, stretchable silicon, pervasive wireless, nuclear reprogramming, nano biomechanics, epigenetics and cognitive radio.

SCI802: ICT and Research Methodologies (2 Units)

This course should cover essentials of Spreadsheets, Internet technology, Statistical Packages, Precision and Accuracy of Estimates, Principles of Scientific Research, Concepts of Hypotheses Formulation and Testing, Organization of Research and Report Writing.

SCI 804 Science, Environment and Innovation (2 Credit Units)

Elements of global warming, environmental protection issues, biodiversity, pollution, species at risk, social and ethical implications of science, enterprise and productivity, intellectual property rights, private public partnership and investment.

ATI899: Dissertation (6 Units)

Students are required to work independently on a project related to a self-selected problem in the field of artificial intelligence. At the beginning of the second semester, students are expected to commence their supervised project work. Students are required to defend the project which will be evaluated by a departmental committee. Note that, no student shall be permitted to defend, except he/she has fulfilled the requirements.

ELECTIVES

ATI821: Basic Probability, Statistics and Algebra (2 Units)

This course will introduce students to the basics of Probability & Statistics, and basics of algebra. Topics Included: Algebraic expressions, algebraic fractions, Binomial expressions, quadratic trinomials, analyzing categorical data, summarizing quantitative data, exploring bivariate numerical data, sampling distributions, analysis of variance (ANOVA)

Recommended reading:

- William Feller, *Introduction to Probability theory and application*
- Trevor Hastie, Robert Tibshirani & Jerome Friedman, *The Elements of Statistical Learning: Data Mining, Inference, and Prediction*, Second Edition Springer Series in Statistics

ATI822: Computational Logic (2 Units)

This course introduces students to the computational dimensions of Logic. It takes computation beyond the manipulation of numerical data to the realm of manipulation of symbolic data. Students will learn to encode information in the form of logic statements and thereby develop the capacity to implement automated reasoning. They will study Knowledge Representation in logical statements by the integration of information and the rules for its application. They will be exposed to the alternative programming paradigm of Logic Programming in Prolog as a declarative programming language in contrast to the more common procedural programming paradigm. They will investigate the application of these ideas in areas such as mathematics, Science, Engineering, business and law.

Recommended reading:

- Steve Reeves & Mike Clarke, *Logic for Computer Science*
- Russell & Norvig, *Artificial Intelligence: A Modern Approach*, Prentice Hall, 3rd edition

ATI823: Introduction to Algorithms (2 Units)

This course gives students a soft landing into Algorithms for those lacking a strong background in it. The course will explore the common algorithms, algorithmic paradigms, and data structures used to solve actual problems. Topics included: searching, sorting, recursion, and graph theory.

Recommended reading:

- Rudolph Russell, *Data Structures and Algorithms: An Easy Introduction*

MIS 804 Data Warehousing and Analytics (2 Credit Units)

This course addresses data warehousing and data analytics concepts. Areas to be covered include: contemporary architectures for designing and implementing data warehouses, creating a scalable infrastructure for big data, creating information architecture for organizations, data collection and method selection for big data analytics, designing and implementing architectures for organizational content management systems.

Learning Resources

Scholarly Articles, E-books (Text books),

Recommended Reading

- Flory, André & Soupirot, Pierre & Tchounikine, Anne. (2001). A Design and implementation of a data warehouse for research administration universities.. 259-267.
- Kimball, R & Reeves, L & Ross, M & Thornthwaite, W. (2008). The Data Warehouse Lifecycle Toolkit.
- Leonard, Edward M. (2011). "Design and Implementation of an Enterprise Data Warehouse" Master's Theses (2009). Paper 119.
- Rogers, Denise. "Data Warehousing Architecture - Designing the Data Staging Area." Database Journal. 22 June 2010. Web. 20 Oct 2011.
- Krishnan, K. (2013). Data Warehousing in the Age of Big Data. 10.1016/C2012-0-02737-8.
- Alan S. (2014). "Modern Enterprise Business Intelligence and Data Management: A Roadmap for IT Directors, Managers, and Architects"
- Steve W. (2016). "Business Intelligence Strategy and Big Data Analytics: A General Management Perspective"

Assessment methods:

Group Essay, Group presentation, Examination

MIS 807 Innovation Management and Organizational Change (2 Credit Units)

This course addresses understanding how organizations can recognize, innovate and cope with change due to updates in current and new information technologies to address business opportunities. Areas to be covered include: monitoring the technology environment, managing

innovation with emerging technologies, adoption and diffusion of innovation, applying innovative thinking to solve technology-related issues, understanding organizational development and change management methods, change management in project lifecycle.

Learning Resources:

Scholarly Articles, E-books (Text books),

Recommended reading:

- Tidd, J., and Bessant, J., 2013. Managing Innovation: Integrating Technological, Market and Organisational Change, Wiley, 5th edition. (e-book)
- Thomas JM. Diffusion of innovation in systematic review methodology: Why is study selection not yet assisted by automation? *OA Evidence-Based Medicine* 2013 Oct 21;1(2):12.
- Rogers, E. M. (2003). *Diffusion of innovations*. New York: Free Press.
- Ivancevich, J. M., Konopaske, R., & Matteson, M. T. (2011). *Organizational behaviour and management*. New York, NY: McGraw-Hill Irwin.
- Pollack, Julien & Algeo, Chivonne. (2015). *The Contribution of Project Management and Change Management to Project Success*.

Assessment methods:

Individual Essay, Group presentation, Examination

CST802: MALWARE AND DIGITAL FORENSICS (3 UNITS)

Malware Analysis, Malware Incident response; Analyzing Physical Process Dumps for Malware Artifacts; Discovering and Extracting Malware and Associated Artefacts from Windows and Linux; Advanced Malware; Investigative and Forensic Methodologies; Forensic Analysis, Preservation and Examination of Volatile Data; Recovery of Deleted Files; Building Live Response Toolkit; Volatile Data and Non-Volatile Data Collection methodologies in Windows and Linux Live Systems; Data analytics; Windows System Forensics; Incident Response Tool Suites for Windows; Memory Forensics Methodology for Windows and Linux; Windows Memory Forensics Tools; Linux Memory Forensics Tools; Forensic Examination of Compromised Systems; Filesystem Forensics, Network Forensics, Using Linux as a Forensic Platform, Audit Trail, Report Writing, Expert Witness

Suggested Lab Work

For the practical component of this course, students should be introduced to using antivirus tools to confirm maliciousness, using hashes to identify malware, gleaning information from a file's strings, functions, and headers. Perform static and dynamic analysis, demonstrate understanding of Sandboxing and Anti-sand Boxing. Conduct investigative forensic methodologies to

demonstrate the use of hex editors to extract file formats and systems, use of a Linux system as forensic station, artefact extraction from web browsers, recovering deleted files using forensic tools, write report on the investigation.

Tools: md5deep, PotentialKeylogger, ApatDNS, NetCat, Wireshark, VMware, FTK, Winhex, X-Ways Forensics, Autopsy/ The Sleuth Kit.

Textbooks

Digital Forensics 1st Edition by Andre Arnes Wiley; 1 edition (2017) ISBN-10: 1119262380

Practical Windows Forensics by Ayman Shaaban and Konstantin Sapronov (2016) Packt Publishing

The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory by Aaron Walters, Andrew Case, Jamie Levy, and Michael Hale Ligh, 1st edition (2014) Publisher Wiley ISBN: 1118825098

File System Forensic Analysis by Brian Carrier, Addison-Wesley Professional 1st Edition (2015), ISBN-13: 978-0321268174

CST807: SECURE SOFTWARE ENGINEERING (2 UNITS)

Security requirements; Specification of security requirements; Software development lifecycle and Security development lifecycle; Programming languages and type-safe languages; Best security programming practices; Writing secure distributed programs: The security ramifications of class, field and method visibility. Character codes (i.e. ASCII, EBCDIC, UNICODE, Excess-3, Grey code, Error checking codes etc. with their needs and utilities.); Secure software, risk analysis, threat modeling, deploying cryptographic algorithms, defensive coding, penetration testing, static analysis, and security assessment; Security for web and mobile applications

Suggested Lab Work

Programming assignments leading to extensive practice in problem solving and program development involving the use of the various data structures, encryption, algorithms implemented in the course.

Textbooks

Software Security: Building Security In by Gary McGraw. Addison-Wesley, ISBN 978-321-35670-3

Software Security Engineering: A Guide for Project Managers by Julia H. Allen, Sean Barnum, Robert J. Ellison, Gary McGraw, and Nancy Mead. Addison-Wesley, ISBN 978-0-32-150917-8

GST807: STUDY GUIDE FOR DISTANCE LEARNING (2 UNITS)

Introduction to the Open and Distance Learning (ODL) System: History of the Open and Distance Learning System, Characteristics of the Open and Distance Learning System, Teaching and Learning in the Open and Distance Learning System. Study Skills for the Distance Learner: Listening, Speaking, Reading, Writing, Study Strategies. Assessment and Evaluation Modes in Open And Distance Learning (ODL): Overview of Assessment in ODL, Instructional-Based Assessment Modes, Semester Examination, Assessment of Non-Examinable Courses. Learners' Support Services: Definition and Purposes of Learners' Support Services, Types of Learners' Support Services, Sources of Learners' Support Services, Benefits of Learners' Support Services.

Recommended Reading

COTTRELL, S., 2003. The Study Skills Handbook. 2nd Edition .Basingstoke: Palgrave.

LEE-DAVIES, L. and BAILEY, S., 2007. Developing work and study skills. [electronic resource]. London: Thomson Learning.

Assessment methods:

· *Group Essay, Seminars, Group presentation, Examination*

Software

1. Java Programming Language
2. Anaconda 3.0
3. Cloudera UM Environment
4. Matlab
5. Python IDE
6. WEKA
7. Python interpreter and IDE

Platforms and Libraries

1. Tensorflow
2. Theano
3. Torch
4. Keras
5. Azure ML
6. Caffe
7. Amazon ML
8. Microsoft Cognitive Toolkit
9. IBM Watson

10. Sciekit – Learn

2.1.2 M. Sc. Cyber Security

1.0 Introduction

The Africa Centre of Excellence on Technology and Enhanced Learning (ACETEL) is a world Bank funded centre established 2019, at National Open University of Nigeria (NOUN). The MSc. Cyber Security programme aims at admitting research-oriented graduates of Cyber Security Science and other related fields into the high echelon of cyber security professionalism. The programme is expected to exploit all the resources in NOUN to guide students into ground-breaking research areas towards concluding their studies with an internationally comparable thesis by each student.

1.1 Philosophy

To build national capacity for the country through theoretical and practical cyber security science leading to advancement in Information and Communication Technology (ICT), minimize cybercrime and develop high level manpower that will create job and wealth through the use of ICT

2.0 Objectives

1. To provide graduates with solid foundation in Cyber Security Science.
2. To provide and promote sound practical and theoretical training in cyber security hardware, software, and application areas that will make our graduates useful in both private and public sectors of the economy.
3. To develop the students for the purpose of self-employment
4. To promote the career opportunities offered by Cyber Security Science and to meet with the ongoing needs of industries.

2.1 Competencies of Graduates

At the end of a successful completion of the Master of Science in Cyber Security programme, our graduates should have abilities to:

1. Analyse cyber security problem, identify and define the requirements appropriate to its solution.
2. Analyse the impact of cyber security on individuals, organizations, and society.
3. Design, implement and evaluate a cyber-security-based system, process, component, or program to meet the desired needs.

4. Apply mathematical foundations, algorithmic principles, and cyber security science theories in the modelling and design of security-based systems in a way that demonstrates comprehension of the trade-offs in design choices.
5. Develop Cyber Security based entrepreneurial skills to thrive in this ICT age.

3.0 Entry Requirements

To be admitted into the MSc. Cyber Security programme, a candidate is expected to fulfil the following minimum requirements:

- i. A Bachelor's degree from a recognised institution with a Second Class Lower in Cyber Security, Information Technology, Communication Technology, Computer Science, Computer Engineering, Electrical Engineering, Electrical/ Electronics, Mathematics, Physics, Physics Electronics, Physics with Mathematics
OR
- ii. A minimum of 3-points from a recognised institution at the PGD level in Cyber Security, Information Technology, Computer Science, Communication Technology, Computer Engineering, Electrical Engineering, Electrical/ Electronics, Mathematics, Physics, Physics Electronics, Physics with Mathematics

(1) In addition, the candidate must possess a minimum of five credits in SSCE/GCE/NECO/NABTEB or its equivalent, at not more than two (2) sittings, in the following subjects: English Language, Mathematics, Physics, Chemistry and any of the following Biology, Agricultural Science, Computer Studies or Further Mathematics.

3.1 Duration of Programs

The programme minimum duration is 3 semesters and the maximum is 6 semesters.

3.2. Graduation requirements

- i. The student must earn a minimum of 36 credit units to graduate as follows:
Core courses=30 credit units including dissertation

Elective courses= 6 credit units electives
- ii. The student must present two seminars before the final defense

- iii. The student is expected to publish in acceptable peer reviewed conference proceedings
/journal
- iv. The minimum CGPA to proceed to dissertation is 3.00 and the minimum graduation CGPA is 3.00

4.0 Outline of Course Structure

The MSc. Cyber Security programme is structured into 3 semesters as shown below:

First semester

Compulsory Courses

Course Code	Course Title	Credit Unit	Status
CST801	Fundamentals of Cyber Security & Cyber Crime	2	Compulsory
CST803	Advanced Cryptography	3	Compulsory
CST805	Computer and Network Security	3	Compulsory
SCI801	Management and Entrepreneurship	2	Compulsory
SCI802	ICT and Research Methodology	2	Compulsory
GST807	Study Guide for ODL	2	Required *
Total Credit Units		14	

* GST807 is required for students who have not enrolled in Distance Learning before

Elective Courses

Course Code	Course Title	Credit Unit	Status
CST807	Secure Software Engineering	2	Elective
CST809	Security Architecture and Design	2	Elective
ATI805	Machine Learning	3	Elective
ATI823	Introduction to Algorithms	2	Elective

Second Semester

Compulsory Courses

Course Code	Course Title	Credit Unit	Status
CST802	Malware and Digital Forensics	3	Compulsory
CST804	Ethical Hacking and Penetration Testing	3	Compulsory
CST806	Cyber war and Cyber Deterrence	2	Compulsory
CST808	Incidence Management and Disaster Recovery	2	Compulsory
CST822	Seminar	2	Compulsory
Total Credit Units		12	

Elective Courses

Course Code	Course Title	Credit Unit	Status
CST810	Web Security	2	Elective
CST812	Cyber Law and Ethics	2	Elective
MIS812	System Development and Deployment	2	Elective

Third Semester

Course Code	Course Title	Credit Unit	Status
CST899	Dissertation	6	Core
Total Credit Units		6	

* Students are required to earn a minimum of 6 units elective before graduation.

DETAILED COURSE CONTENT SPECIFICATION

CST801: FUNDAMENTALS OF CYBER SECURITY & CYBER CRIME (2 UNITS)

An overview of the various branches of computing security, cybersecurity concepts, challenges, and tools that are critical in solving problems in the computing security domain. Basics on network security, threat landscape, authentication, malware, cryptography, risk management, incident management; current trends in cybersecurity, cybercrime, Cyber threats, attacks, terrorism, investigation methods and techniques, economies of cybercrime, incidence management, emerging threats, cyber espionage, countermeasures, Cybercriminal behaviour.

Textbooks

Computer Security Fundamentals, 3rd Edition by William (Chuck) Easttom Published by Pearson T Certification ISBN-13: 978-0-7897-5746-3

Information Security Fundamentals, 2nd Edition Thomas R. Peltier Published By: Auerbach Publications ISBN-10: 143981063X

Cybercrime and Digital Forensics: An Introduction by Thomas J. Holt, Adam M. Bossler, Kathryn C. Seigfried-Spellar 1st Edition (2015) Publisher: Routledge. ISBN-10: 9781138021303

CST802: MALWARE AND DIGITAL FORENSICS (3 UNITS)

Malware Analysis, Malware Incident response; Analysing Physical Process Dumps for Malware Artefacts; Discovering and Extracting Malware and Associated Artefacts from Windows and Linux; Advanced Malware; Investigative and Forensic Methodologies; Forensic Analysis, Preservation and Examination of Volatile Data; Recovery of Deleted Files; Building Live Response Toolkit; Volatile Data and Non-Volatile Data Collection methodologies in Windows and Linux Live Systems; Data analytics; Windows System Forensics; Incident Response Tool Suites for Windows; Memory Forensics Methodology for Windows and Linux; Windows Memory Forensics Tools; Linux Memory Forensics Tools; Forensic Examination of Compromised Systems; Filesystem Forensics, Network Forensics, Using Linux as a Forensic Platform, Audit Trail, Report Writing, Expert Witness

Suggested Lab Work

For the practical component of this course, students should be introduced to using antivirus tools to confirm maliciousness, using hashes to identify malware, gleaning information from a file's strings, functions, and headers. Perform static and dynamic analysis, demonstrate understanding of Sandboxing and Anti-sand Boxing. Conduct investigative forensic methodologies to demonstrate the use of hex editors to extract file formats and systems, use of a Linux system as forensic station, artefact extraction from web browsers, recovering deleted files using forensic tools, write report on the investigation.

Tools: md5deep, PotentialKeylogger, ApateDNS, NetCat, Wireshark, VMware, FTK, Winhex, X-Ways Forensics, Autopsy/ The Sleuth Kit.

Textbooks

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Practical Windows Forensics by Ayman Shaaban and Konstantin Saponov (2016) Packt Publishing

The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory by Aaron Walters, Andrew Case, Jamie Levy, and Michael Hale Ligh, 1st edition (2014) Publisher Wiley ISBN: 1118825098

File System Forensic Analysis by Brian Carrier, Addison-Wesley Professional 1st Edition (2015), ISBN-13: 978-0321268174

CST803: ADVANCED CRYPTOGRAPHY (3 UNITS)

Private-key cryptosystems; Advanced Encryption Standard (AES); Overview of modular arithmetic, discrete logarithms, and primality/factoring; Public-key cryptosystems; ElGamal cryptosystem, Basic signature schemes; Algebra and number theory; Discrete logarithm based cryptosystems and signatures: Elliptic Curve Cryptosystem (ECC), Digital Signature Standard (DSS), Selection of other signature schemes, Overview of discrete logarithm algorithms, Ethical aspects of public-key cryptosystems and signatures. Hashing, emerging SHA-3 standard. Interactive protocols; Touch of complexity theory, Interactive proof systems; 0-knowledge proof systems, 0-knowledge authentication, Electronic cash; Chaum and Brands schemes, Private information retrieval; selected topics in quantum computing.

Suggested Lab Work

For the practical component of this course the student should use GPG, OpenSSL to demonstrate symmetric and asymmetric encryption/decryption and MD5, SHA-1 to demonstrate hash functions. Study forms of attack (Dictionary attack, Brute force attack). Understand CrypTool, implement the algorithms for DES, RSA, MD5, SHA-1. Use Advanced Encryption Standard (AES) to protect volumes, Use Cipher Block Chaining to generate a MIC (Message integrity code), Database Encryptions, wireless security standards (WEP, WPA, WPA2), Using hashes to identify malware.

Tools Needed: Virtual Machine (Kali), CrypTool.

Textbooks

Cryptography: Theory and Practice by Douglas R. Stinson, CRC Press, 3rd Edition 2006

Handbook of Applied Cryptography Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, CRC Press 1996.

Cryptography and Network Security: Principles and Practice by William Stallings Pearson; 7th Edition (2016), ISBN-10: 0134444280

CST804: ETHICAL HACKING AND PENETRATION TESTING (3 UNITS)

Focuses on penetration testing and vulnerability analysis. Introduces methodologies, techniques and tools to analyse and identify vulnerabilities in stand-alone and networked applications. An in-depth understanding of penetration (pen) testing and "ethical hacking", including requirements and reporting. Students will examine the business impact of testing and will conduct security testing (including network and web application penetration testing) in the lab environment that includes intelligence gathering, identifying and exploiting vulnerabilities, conducting post-exploitation exercises, and reporting results. Students will be required to create a comprehensive report summarizing the findings including recommendations to mitigate the risks identified. Topics will include social engineering, web application testing, managing a security test, and tools of attack

Suggested Lab Work

For the practical component of this course the student should demonstrate Footprinting techniques on systems, Create Attack and Penetration Test Plan, compromise and exploitation of networks, social engineering methods.

Textbooks

Hacker Techniques, Tools, and Incident Handling, 3rd Edition by Michael G. Solomon, Sean-Philip Oriyano Publisher: Jones & Bartlett Learning 2018. ISBN: 9781284147810

CST805: COMPUTER AND NETWORK SECURITY (3 UNITS)

Contemporary Security, Network Intrusion detection systems, network threat and mitigation, Password Cracking, Port Scanning. Attacks and threats on computer; transmission protocols and layers. attacks on DNS and leveraging P2P deployments; Data analytics, monitoring real-time network activities enables agile decision making, detection of suspected malicious activities, utilization of a real-time visualization dashboard, and employment of a set of hardware and software to manage such detected suspicious activities.

Suggested Lab Work

For the practical component of this course, the student should study and set the features of firewall in providing network security, set Firewall Security in different servers (Windows, Linux, Mac)

Study and analyse of different types of vulnerabilities for hacking Websites/Web applications. Perform an analysis the Security Vulnerabilities of E-commerce services, Blockchain Wallet, and Payment aggregator. Learn to use network security tools like GnuPG, KF sensor, Net Strumbler

Textbook:

Cryptography and Network Security: Principles and Practice by William Stallings Pearson; 7th Edition (2016) ISBN-10: 0134444280

CST806: CYBER WAR AND CYBER DETERRENCE (2 UNITS)

Introduction to Cyber Warfare Threats landscape: definition of cyberwar, motivation, attackers, threats, fifth domain on warfare, differences between cyber warrior and traditional warrior; Analysis of Cyber Attacks; Cyber Weapons; Cyber Warfare Attacks and Tactics; Cyber Defence Tactics; Cyber Warfare Doctrine and Strategy; Cyber Warfare Capabilities by Nation; Legal Status and Ethics of Cyber Warfare; Emerging trends in Cyber Warfare.

Textbooks

Inside Cyber Warfare: Mapping the Cyber Underworld Jeffrey Carr O'Reilly Media (2011) ISBN 1449310044

Cyber Warfare: Techniques, Tactics and Tools for Security Practitioners by Jason Andress and Steve Winterfeld, 2nd Edition Elsevier (2014) ISBN 978-0-12- 416672-1

Cyber Warfare and the Laws of War by Heather Harrison Dinniss Cambridge University Press (2012) ISBN 9780511894527

The Basics of Cyber Warfare: Understanding the Fundamentals of Cyber Warfare in Theory and Practice by Steve Winterfeld and Jason Andress Elsevier (2012) ISBN 978-0-12- 404737-2

CST807: SECURE SOFTWARE ENGINEERING (2 UNITS)

Security requirements; Specification of security requirements; Software development lifecycle and Security development lifecycle; Programming languages and type-safe languages; Best

security programming practices; Writing secure distributed programs: The security ramifications of class, field and method visibility. Character codes (i.e. ASCII, EBCDIC, UNICODE, Excess-3, Grey code, Error checking codes etc. with their needs and utilities.); Secure software, risk analysis, threat modelling, deploying cryptographic algorithms, defensive coding, penetration testing, static analysis, and security assessment; Security for web and mobile applications

Suggested Lab Work

Programming assignments leading to extensive practice in problem solving and program development involving the use of the various data structures, encryption, algorithms implemented in the course.

Textbooks

Software Security: Building Security in by Gary McGraw. Addison-Wesley, ISBN 978-321-35670-3

Software Security Engineering: A Guide for Project Managers by Julia H. Allen, Sean Barnum, Robert J. Ellison, Gary McGraw, and Nancy Mead. Addison-Wesley, ISBN 978-0-32-150917-8

CST808: INCIDENT MANAGEMENT AND DISASTER RECOVERY (2 UNITS)

An Overview of Information Security and Risk Management: Overview of Risk Management, Contingency Planning and Its Components, Role of Information Security Policy in Developing Contingency Plans. Planning for Organizational Readiness; Disaster Recovery Philosophy, Principles and Planning, Contingency Plan Components, Agency response procedures and Continuity of Operations, Planning Processes, Continuity and Recovery Function, Steps of Disaster Recovery Planning Elements Required to Begin Contingency Planning, Contingency Planning Policy, Business Impact Analysis, BIA Data Collection, Budgeting for Contingency Operations. Contingency Strategies for IR/DR/BC; Data and Application Resumption, Site Resumption Strategies. Incident Response: Planning, Detection, Decision Making, Strategies, Recovery and Maintenance. Business Continuity Planning, Crisis Management and International Standards in IR/DR/BC

Textbooks

Principles of Incident Response and Disaster Recovery by Michael E. Whitman; Herbert J. Mattord and Andrew Green Publisher: Cengage Learning 2nd Edition, (2014) ISBN: 9781111138059

Incident Response & Computer Forensics, Third Edition 3rd Edition by Jason T. Luttgens, Matthew Pepe and Kevin Mandia Publisher McGraw-Hill Education; 3 edition (2014) ISBN 9780071798686.

CST809: SECURITY ARCHITECTURE AND DESIGN (2 UNITS)

Fundamental components to security architecture; Components design; Principles of secure component design; Component identification; Anti-reverse engineering techniques; Side-channel attack mitigation; Anti-tamper technologies; open and distributed systems; and protection mechanism; formal security models and evaluation criteria; Project on modelling secure system.

Suggested Lab Work

Programming assignments leading to extensive practice in endpoint security, mail security, network security, cloud security, BYOD. Design systems using Open Enterprise Security Architecture (O-ESA), Secure Collaboration-Oriented Architectures (OSCOA), SABSA security architecture frameworks. Conduct Architecture Risk Assessment.

Textbooks

Securing Systems: Applied Security Architecture and Threat Models 1st Edition by Brook S.E. Schoenfield CRC Press (2015)

CST810: WEB SECURITY (2 UNIT)

Security Fundamentals, creating web pages and running web servers, JavaScript: the language, and the browser runtime, Client-side attacks and defences, Single Page Applications, Web application back ends, Web application backing stores, Advanced side channel attacks, Web privacy, Human factors / Usable web security, Scaling and securing web applications, Advanced tooling and performance techniques.

Textbook

The Tangled Web: A Guide to Securing Modern Web Applications by Michał Zalewski (2012)
Publisher William Pollock

CST822: SEMINAR (2 UNITS) – Split into First and Second Semesters

Literature study, writing up and oral presentation of a topic on an aspect of Cyber Security as approved by the Centre.

CST812: CYBER LAW AND ETHICS (2 UNITS)

Legal and policy challenges of evolving cybersecurity threats at national and international level, legal frameworks; Cyber regulation, Standards, law and technology; National and International

governing authorities; Security governance and policy; Privacy law; Security policy development cycle; Property-rights legislation; Virtue ethics; Utilitarian ethics and deontological ethics

Textbooks

Cyberethics: Morality and Law in Cyberspace by Richard Spinello, 6th Edition (2016), Jones & Bartlett Learning, ISBN-13: 978-1284081398

Cyber War: Law and Ethics for Virtual Conflicts, by Claire Finkelstein, Kevin Govern, Jens David Ohlin (Editors), Oxford University Press; 1 edition (2015) ISBN-13: 978-0198717508

Cyberlaw: The Law of the Internet and Information Technology by Brian Craig, 1st Edition (2012), Pearson, ISBN-13: 978-0132560870

CST899: DISSERTATION (6 UNITS)

Students will be expected to carry out a study in a relevant area of Cyber Security and submit a report which involves an extensive use of cyber security analysis tools. The thesis should lay much emphasis on the application of Cyber Security in the society.

GST807: STUDY GUIDE FOR DISTANCE LEARNING (2 UNITS)

Introduction to the Open and Distance Learning (ODL) System: History of the Open and Distance Learning System, Characteristics of the Open and Distance Learning System, Teaching and Learning in the Open and Distance Learning System. Study Skills for the Distance Learner: Listening, Speaking, Reading, Writing, Study Strategies. Assessment and Evaluation Modes in Open and Distance Learning (ODL): Overview of Assessment in ODL, Instructional-Based Assessment Modes, Semester Examination, Assessment of Non-Examinable Courses. Learners' Support Services: Definition and Purposes of Learners' Support Services, Types of Learners' Support Services, Sources of Learners' Support Services, Benefits of Learners' Support Services.

Recommended Reading

- COTTRELL, S., 2003. The Study Skills Handbook. 2nd Edition. Basingstoke: Palgrave.
- LEE-DAVIES, L. and BAILEY, S., 2007. Developing work and study skills. [electronic resource]. London: Thomson Learning.

Assessment methods:

- Group Essay, Seminars, Group presentation, Examination

SCI801: MANAGEMENT AND ENTREPRENEURSHIP (2 UNITS)

The course will cover business environment, general management, financial management, entrepreneurship development, feasibility studies, marketing and managerial problem solving.

SCI 802: ICT AND RESEARCH METHODOLOGY (2 UNITS)

This course should cover essentials of Spreadsheets, Internet technology, Statistical Packages, Precision and Accuracy of Estimates, Principles of Scientific Research, Concepts of Hypotheses Formulation and Testing, Organization of Research and Report Writing.

LABORATORY REQUIREMENTS

See attached

REFERENCE

1. Federal University of Technology, Minna. Cyber Security Science Department curriculum.
2. Computer Systems Security. MIT open courseware.
3. *ACM/IEEE/AIS SIGSEC/IFIP Cybersecurity Curricular Guideline*
4. A Report in the Computing *Curricula* Series. Joint Task Force on *Cybersecurity* Education. Association for Computing Machinery (ACM). *IEEE*

2.1.3 M. Sc. Management Information System

Introduction

1.0 Name of the Programme: MSc. Management Information Systems

Programme Code: 5412

2.0 Entry Requirements

To be admitted into the MSc. Management Information System, a candidate is expected to fulfil the following minimum requirements:

- v. A Bachelor's degree from a recognised institution with a Second Class Lower in Cyber Security, Information Technology, Communication Technology, Computer Science,

Computer Engineering, Electrical Engineering, Electrical/ Electronics, Mathematics, Physics, Physics Electronics, Physics with Mathematics
OR

- vi. A minimum of 3-points from a recognised institution at the PGD level in Cyber Security, Information Technology, Computer Science, Communication Technology, Computer Engineering, Electrical Engineering, Electrical/ Electronics, Mathematics, Physics, Physics Electronics, Physics with Mathematics

(2) In addition, the candidate must possess a minimum of five credits in SSCE/GCE/NECO/NABTEB or its equivalent, at not more than two (2) sittings, in the following subjects: English Language, Mathematics, Physics, Chemistry and any of the following Biology, Agricultural Science, Computer Studies or Further Mathematics.

3.1 Duration of Programs

The programme minimum duration is 3 semesters and the maximum is 6 semesters.

3.2 Graduation requirements

- v. The student must earn a minimum of 36 credit units to graduate as follows:
Core courses=30 credit units including dissertation

Elective courses= 6 credit units electives
- vi. The student must present two seminars before the final defense
- vii. The student is expected to publish in acceptable peer reviewed conference proceedings /journal
- viii. The minimum CGPA to proceed to dissertation is 3.00 and the minimum graduation CGPA is 3.00

2.0 Aims and Objectives

The MSc. Management Information Systems programme is designed to prepare graduates for challenging careers involving the design, analysis, implementation and operation of computer-based information systems.

5.1 Aims

The MSc. Management Information Systems programme aims at admitting research-oriented graduates of Management Information Systems and other related fields into the high stratum of management information systems professionals. The programme is expected to exploit all the resources (both electronic and hard copy), in NOUN to guide students into ground-breaking research and producing world-class dissertations.

Course Code	Course Title	Credit Unit	Status
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5.2 Objectives

The objectives of the postgraduate MIS programmes are to:

- i. To produce high level manpower in MIS through the acquisition of requisite skills and knowledge, for national development.
- ii. To develop in MIS graduates a sense of inquiry, capacity for independent research and motivation to extend the frontiers of MIS technology.
- iii. To produce graduates who will be adequately equipped for relevance in the global knowledge economy.
- iv. To produce graduates who are capable of applying appropriate MIS principles for solving problems for the promotion of human well being.
- v. To produce manpower with optimal competencies and skills to function effectively in the academia and the private sector.

3.0 Programme Structure and Degree Rules

The MSc. Management Information Systems programme is structured into 2 semesters as presented in the tables shown below:

4.0 1st SEMESTER

6.1 Outline of Course Structure

SCI801	Management & Entrepreneurship	2	Core
SCI802****	ICT & Research Methodology	2	Core
GST807	The Study Guide	2	Core
MIS801	IT Infrastructure	3	Core
MIS803	Enterprise Data Management	3	Core
MIS805	Enterprise Systems	3	Core
MIS811	Information Systems Requirement Engineering	2	Core
	Sub-total	17	
	Select 2 from Elective		
ATI823	Introduction to Algorithms	2	Elective
CST801	Fundamentals of Cyber Security and Cyber Crime	2	Elective
MIS807	Innovation Management and Organizational Change	2	Elective
MIS809	IS Strategy Planning & Governance	2	Elective
	TOTAL	21	

2nd SEMESTER

Course Code	Course Title	Credit Unit	Status
MIS802	Business Continuity & Information Security	3	Core
MIS806	Business Process Analysis & Engineering	2	Core
MIS808	Ethics and Society	2	Core
MIS810	Information Systems Management & Operations	2	Core
MIS820	Seminar	2	Core

	Sub-total	11	
	Select 1 from Elective		
ATI822	Computational Logic	2	Elective
CST806	Cyber War and Cyber Deterrence	2	Elective
MIS804	Data Warehousing and Analytics	2	Elective
MIS812	Systems Development and Deployment	2	Elective
	TOTAL	13	

Note: Students are required to take a maximum of six credit units of elective. Students may choose to take four credit units of elective in the first semester and two credit units in the second semester or vice-versa.

3RD SEMESTER

Course Code	Course Title	Credit Unit	Status
MIS899	Project	6	Core
	Total	6	

All students of the MSc. Management Information Systems programme are required to obtain a minimum of 31 credit units

DETAILED COURSE CONTENT SPECIFICATION

GENERAL COURSES

All postgraduate students (irrespective of the programme) must take Management and Entrepreneurship as well as ICT & Research Method as compulsory courses. However, any student who has taken them at a particular postgraduate level is exempted at higher levels.

SCI801 Management and Entrepreneurship (2 Credit Units)

The course will cover business environment, general management, financial management, entrepreneurship development, feasibility studies, marketing and managerial problem solving.

SCI802 ICT and Research Methodology (2 Credit Units)

This course should cover essentials of Spreadsheets, Internet technology Statistical Packages, Precision and Accuracy of Estimates, Principles of Scientific Research, Concepts of Hypotheses Formulation and Testing, Organization of Research and Report Writing.

SCI803 Emerging Technologies (2 Credit Units)

Nano technology, stretchable silicon, pervasive wireless, nuclear reprogramming, nano biomechanics, epigenetics and cognitive radio will be covered in this course.

SCI804 Science, Environment and Innovation (2 Credit Units)

Elements of global warming, environmental protection issues, biodiversity, pollution, species at risk, social and ethical implications of science, enterprise and productivity, intellectual property rights, private public partnership and investment will be covered in this course.

GST807 The Study Guide

Introduction to the Open and Distance Learning (ODL) System: History of the Open and Distance Learning System, Characteristics of the Open and Distance Learning System, Teaching and Learning in the Open and Distance Learning System. Study Skills for the Distance Learner: Listening, Speaking, Reading, Writing, Study Strategies. Assessment and Evaluation Modes in Open And Distance Learning (ODL): Overview of Assessment in ODL, Instructional-Based Assessment Modes, Semester Examination, Assessment of Non-Examinable Courses. Learners' Support Services: Definition and Purposes of Learners' Support Services, Types of Learners' Support Services, Sources of Learners' Support Services, Benefits of Learners' Support Services.

Recommended Reading

- COTTRELL, S., 2003. The Study Skills Handbook. 2nd Edition .Basingstoke: Palgrave.
- LEE-DAVIES, L. and BAILEY, S., 2007. Developing work and study skills. [electronic resource]. London: Thomson Learning.

Assessment methods:

- Group Essay, Seminars, Group presentation, Examination

COURSES

MIS801 IT Infrastructure (3 Credit Units)

This course addresses IT network infrastructure to serve different organizational needs in a rapidly changing competitive and technological environment. Areas to be covered include: designing data communication networks and data center server solutions, designing infrastructure solutions using external service provider(s) (cloud computing), managing and negotiating infrastructure contracts/SLAs with vendors, selecting appropriate client devices to support the needs of an application area, developing and responding to requests for proposals (RFPs) for infrastructure solutions.

Learning Resources:

Scholarly Articles, E-books (Text books)

Recommended Reading

- MOELLER, R. 2013. Executive's guide to IT governance: improving systems processes with service management, CORBIT, and ITIL.
- GANNON, T. 2012. IT Service management foundation practice questions (electronic resource): for ITIL foundation exam candidates 2nd ed.

Assessment methods:

- Group Essay, Seminars, Group presentation, Examination , ITIL, COBIT

MIS802 Business Continuity & Information Security (3 Credit Units)

This course addresses the issues relating to Business Continuity planning, auditing and Information Security Management. Areas to be covered include: network and software security management practices, managing systems risk and recovery, monitoring and protecting systems operations and IT assets, implementing and managing quality audit processes and assuring safety throughout system lifecycle.

Learning Resources

Scholarly Articles, E-books (Text books),

Recommended Reading

- Whitman, M. E. & Mattord, H. J. (2003). Principle of Information Security. Boston, MA: Course Technology, Thomson Learning Inc.
- K. Julisch et al., Compliance by design - Bridging the chasm between auditors and IT architects Computers & Security 30(6-7): 410-426 (2011)
- Robert Lee (2019) The Active Cyber Defense Cycle Wiley
- Kevin Roebuck (2011) Business Continuity and Disaster Recovery: High-Impact Technology Emereo Pty Ltd
- Kiran Kumar Pabbathi (2014) Guidance for IT Asset Management (ITAM) ServiceManagers.org
- Monique Beedles (2016) Asset Management for Directors Australian Institute of Company Directors

Assessment methods:

- Group Essay, Seminars, Group presentation, Examination

MIS803 Enterprise Data Management (3 Credit Units)

This course addresses key data and information concepts. Areas to be covered include: Data and information management lifecycle, Conceptual modelling techniques for capturing and structuring data and information requirements, Logical level representation of data based on a conceptual model, Implementing a database solution for multiple applications, and use of contemporary data manipulation, retrieval and management technologies. Other areas include use of appropriate techniques/technologies for securing data, protecting user privacy and organizational intellectual property.

Learning Resources

Scholarly Articles, E-books (Text books),

Recommended Reading

- Carlo Batini, Stefano Ceri, Shamkant B. Navathe, 1992. Conceptual Database Design: An Entity-Relationship Approach
- Zinke-Wehlmann, Christian & Anke, Jürgen & Meyer, Kyrill & Schmidt, Johannes. (2018). Modeling, Analysis and Control of Personal Data to Ensure Data Privacy – A Use Case Driven Approach. 87-96. 10.1007/978-3-319-60585-2_10.
- E. Short, James. (2019). Information Lifecycle Management Concepts, Practices, and Value.
- Gunjal, Bhojaraju. (2003). Database Management: Concepts and Design.
- A. Faye Borthick, Paul L. Bowen, and Gregory J. Gerard (2008) Modeling a Business Process and Querying the Resulting Database: Analyzing RFID Data to Develop

Business Intelligence. Journal of Information Systems: Fall 2008, Vol. 22, No. 2, pp. 331-350.

- Alan S. (2014). “Modern Enterprise Business Intelligence and Data Management: A Roadmap for IT Directors, Managers, and Architects

Assessment methods:

Group Essay, Seminars, Group presentation, Examination

MIS805 Enterprise Systems (3 Credit Units)

This course addresses the systematic understanding and knowledge of enterprise systems principles management. Areas to be covered include: Introduction to business functions, processes and data requirements within an enterprise, Enterprise wide IT systems, Managing Enterprise through ERP. ERP concepts, techniques, tools, selection and implementation issues. Other areas include SAP based hands-on case studies.

Learning Resources:

Scholarly Articles, E-books (Text books),

Recommended Reading

- Motiwalla, L. F., and J. Thompson, 2009 Enterprise Systems for Management, Pearson Prentice Hall,
- Kumar S., Esteves J., Bendoly E., 2011 Handbook of Research in Enterprise Systems SAGE Publishing

Assessment methods:

- Peer learning, Online Activities, Coursework by analyzing case studies, Closed Book Examination

MIS806 Business Process Analysis & Engineering (2 Credit Units)

This course addresses business processes management and improvement. Areas to be covered include: concepts and methods in business process management (e.g., lean & six sigma processes), business process models and charts, business process reengineering and improvement cases.

Learning Resources

Scholarly Articles, E-books (Text books),

Recommended Reading

- Business process analysis and engineering textbook by Geoffrey Darnton
- Originally published: 26 February 2013 Fundamentals of Business Process Management Textbook by Hajo, Jan Mendling, Marcello La Rosa, and Morlon Dumas.
https://books.google.com.ng/books/about/Fundamentals_of_Business_Process_Management.html?id=KgVTDwAAQBAJ&printsec=frontcover&source=kp_read_button&redir_esc=y#v=onepage&q&f=false
- GALLIERS R. D. and LEIDNER D. E. (eds.), 2009. Strategic Information Management: Challenges
- ROSS, J., WEILL, P., and ROBERTSON, D.C., 2006. Enterprise Architecture as Strategy: Creating a Foundation for Business Execution. HBS
- Originally published 2006 Business Process Management: Practical Guidelines to Successful Implementations book by Johan Neils and John Jeston
https://books.google.com.ng/books/about/Business_Process_Management.html?id=4Lx2_z9Hw_MC&printsec=frontcover&source=kp_read_button&redir_esc=y#v=onepage&q&f=false
- Business process change, second edition: A guide for business managers and BPM and Six Sigma professionals <https://www.elsevier.com/books/business-process-change/harmon/978-0-12-374152-3>

Assessment methods:

- Group Essay, Seminars, Group presentation, Examination

MIS808 Ethics and Society (2 Credit Units)

This course addresses key questions on environmental and social sustainability, safety and health, privacy and integrity as they relate to information systems. Areas to be covered include: designing, managing and aligning IT operations for organizational sustainability. Basic concepts of responsibility, accountability, and liability in IS procurement practices. Other areas to include: ensuring protection of privacy and integrity in compliance with legislations, regulations and standards.

Learning Resources

Scholarly Articles, E-books (Text books), Policy, Regulations and Legislations.

Recommended Reading

- Jessup, L. M. & Valacich, J. S. (2003). Information Systems Today. Upper Saddle River, NJ: Prentice-Hall.
- Laudon, K.C. & Laudon, J.P. (2005). Management Information Systems (9th ed). Upper Saddle River, NJ: Prentice-Hall, Inc.
- O'Brien, J. A. (2005). Introduction to Information Systems. Irwin, New York, NY: McGraw-Hill.
- Panko, R. R. (2004). Corporate Computer and Network Security. Upper Saddle River, NJ: Prentice Hall.
- Spinello, R. A. (2003). Cases Studies in Information Technology Ethics. Upper Saddle River, NJ: Prentice-Hall.
- Whitman, M. E. & Mattord, H. J. (2003). Principle of Information Security. Boston, MA: Course Technology, Thomson Learning Inc.
- Nigeria Data Protection Regulation 2019
- Cybercrime (Prohibition, Prevention, etc) Act 2015

Assessment methods:

- Group Essay, Seminars, Group presentation, Examination

MIS810: Information Systems Management & Operations (2 Credit Units)

This course addresses operations, management and decision making of an effective IS organization. Areas to be covered include: principles and strategies of operations management. Managing IS functions, staff, service productions and sourcing models. Managing and coordinating information resources. Managing IS project portfolio, software and hardware development and maintenance. Use of project management tools and techniques. Implementing relevant IT governance frameworks within the organization based on strategic guidance in line with laws and regulations directly affecting IS management and operations.

Learning Resources

Scholarly Articles, E-books (Text books),

Recommended Reading

- University of London Information systems foundations of e-business Volume 1 by R. Shipsey 2010 <https://london.ac.uk/sites/default/files/study-guides/information%20systems-foundations-e-business.pdf>
- <https://opentextbc.ca/businessopenstax/chapter/management-information-systems/>

- Management information systems stephen b. Harsh michigan state university
<https://pdfs.semanticscholar.org/d824/cfa0e5a16f305c6873a444bb979c08562685.pdf>

Assessment methods:

- Group Essay, Seminars, Group presentation, Examination

MIS811 Systems & User Experience Design (2 Credit Units)

The course addresses issues relating to analysis, specification and documenting requirements for IT artifacts. It also covers design of systems, services and user experiences. Areas to be covered include: overview and potentials of emerging technologies in supporting modern businesses. Systems requirements gathering, specification and documentation. Systems design and implementation alternatives. Designing systems, services and user experiences.

Learning Resources:

Scholarly Articles, E-books (Text books),

Recommended Reading

- Ritter FE, Baxter GD, Churchill EF. Foundations for Designing User-Centered Systems. London: Springer-Verlag; 2014.
- Baldwin H. Tech hotshots: The rise of the UX expert. CIO Magazine. 2013. Available at: <http://www.cio.com/article/2389056/careers-staffing/tech-hotshots-- the-rise-of-the-ux-expert.html>. Accessed February 2, 2015.
- Norman DA, Draper SW. User Centered System Design: New Perspectives on Human-Computer Interaction. (Norman DA, Draper SW, eds.). Hillsdale, NJ: L. Erlbaum Associates Inc.; 1986.
- Cooper A. About Face 3: the Essentials of Interaction Design. Indianapolis, IN: Wiley; 2007.
- Pratt A, Nunes J. Interactive Design: an Introduction to the Theory and Application of User-Centered Design. Beverly, MA: Rockport

Assessment methods:

- Individual Essay, Group presentation, Examination

MIS899 Projects

A key element of the Master's programme is the project work undertaken. At the beginning of the second semester, students are expected to commence their supervised project work. They are required to defend the project which will be evaluated by a departmental committee. Note that, no student shall be permitted to defend, except he/she has fulfilled the requirements The

individual research project is either industrially or NOUN driven. Students select the individual project in consultation with the Supervisor and the Department. It provides students with the opportunity to demonstrate independent research ability, the ability to think and work in an original way, contribute to knowledge, and overcome genuine problems in manufacturing. The projects are sponsored by industrial organisations.

ELECTIVE COURSES

MIS804 Data Warehousing and Analytics (2 Credit Units)

This course addresses data warehousing and data analytics concepts. Areas to be covered include: contemporary architectures for designing and implementing data warehouses, creating a scalable infrastructure for big data, creating information architecture for organizations, data collection and method selection for big data analytics, designing and implementing architectures for organizational content management systems.

Pre-requisite: MIS 803

Learning Resources

Scholarly Articles, E-books (Text books),

Recommended Reading

- Flory, André & Soupirot, Pierre & Tchounikine, Anne. (2001). A Design and implementation of a data warehouse for research administration universities.. 259-267.
- Kimball, R & Reeves, L & Ross, M & Thornthwaite, W. (2008). The Data Warehouse Lifecycle Toolkit.
- Leonard, Edward M. (2011). "Design and Implementation of an Enterprise Data Warehouse" Master's Theses (2009). Paper 119.
- Rogers, Denise. "Data Warehousing Architecture - Designing the Data Staging Area." Database Journal. 22 June 2010. Web. 20 Oct 2011.
- Krishnan, K. (2013). Data Warehousing in the Age of Big Data. 10.1016/C2012-0-02737-8.
- Alan S. (2014). "Modern Enterprise Business Intelligence and Data Management: A Roadmap for IT Directors, Managers, and Architects"
- Steve W. (2016). "Business Intelligence Strategy and Big Data Analytics: A General Management Perspective"

Assessment methods:

Group Essay, Group presentation, Examination

MIS807 Innovation Management and Organizational Change (2 Credit Units)

This course addresses understanding how organizations can recognize, innovate and cope with change due to updates in current and new information technologies to address business opportunities. Areas to be covered include: monitoring the technology environment, managing innovation with emerging technologies, adoption and diffusion of innovation, applying innovative thinking to solve technology-related issues, understanding organizational development and change management methods, change management in project lifecycle.

Learning Resources:

Scholarly Articles, E-books (Text books),

Recommended reading:

- Tidd, J., and Bessant, J., 2013. Managing Innovation: Integrating Technological, Market and Organisational Change, Wiley, 5th edition. (e-book)
- Thomas JM. Diffusion of innovation in systematic review methodology: Why is study selection not yet assisted by automation? *OA Evidence-Based Medicine* 2013 Oct 21;1(2):12.
- Rogers, E. M. (2003). *Diffusion of innovations*. New York: Free Press.
- Ivancevich, J. M., Konopaske, R., & Matteson, M. T. (2011). *Organizational behaviour and management*. New York, NY: McGraw-Hill Irwin.
- Pollack, Julien & Algeo, Chivonne. (2015). *The Contribution of Project Management and Change Management to Project Success*.

Assessment methods:

Individual Essay, Group presentation, Examination

MIS809 IS Strategy Planning & Governance

This course addresses the use of information systems to achieve strategic organizational goals and objectives. Areas to be covered include: Mission objectives and goals setting. Strategy levels and hierarchy. Information capital, needs and value. Capacity and capability planning. Making financial case for IS. Planning and implementing IS Governance including critical review and analysis of governance frameworks.

Learning Resources:

Scholarly Articles, E-books (Text books)

Recommended Reading

- MACLENNAN, A., 2014. Information governance and assurance: reducing risk, promoting policy. London: Facet.
- GALLIERS R. D. and LEIDNER D. E. (eds.), 2009. Strategic Information Management: Challenges
- WARD, J. and PEPPARD, J., 2016. Strategic Planning for Information Systems. 4th Ed. Chichester: John Wiley & Sons.
- ROSS, J., WEILL, P., and ROBERTSON, D.C., 2006. Enterprise Architecture as Strategy: Creating a Foundation for Business Execution. HBS.
- MOHAPATRA, S., & SINGH, R. P. 2012. Information Strategy Design and Practices. Springer Science & Business Media.

Assessment methods:

- Individual Essay, Group presentation, Examination

MIS812 Systems Development and Deployment (2 Credit Units)

The course addresses issues on development, deployment and testing IT artifacts that meet specified requirements. Topics covered include: systems development approaches. Managing plan-based, hybrid, and agile development Processes. Implementing, testing, installing and integrating a new application. Managing external systems development resources and IS development projects. Deploying a new system to organizational use.

Pre-requisite: MIS811

Learning Resources:

Scholarly Articles, E-books (Text books)

Recommended Reading

- Abelson, H., & Greenspun, P. (2008). Teaching software engineering-lessons from MIT. Retrieved Oct. 2008 from <http://philip.greenspun.com/teaching/teaching-software-engineering>
- Bach, J. (1997). SE education: We're on our own. IEEE Software, 6, 26-28.
- Cohen, P. (1987, March). The education of the information systems engineer. Electronics & Power, pp. 203-205.
- Colvin, J. (2005). Teaching software development to non-software engineering students. Proceedings of Conf. on Frontiers in Education: CS and CE (FECS'05) Las Vegas, Nevada, USA, June 20-23, pp. 3- 9.
- Diaz-Herrera, J., & Powell, J. (1998). Educating industrial-strength software engineers. Proceedings of the Eleventh Conference on Software Engineering Education and Training, IEEE Computer Society. pp. 139-150.

- Garratt, P., & Edmunds, G. (1988). Teaching software engineering at university. *Information and Software Technology*, 30(1), 5-11.
- Hilburn, T., Bagert, D., Mengel, S., & Oexmann, D. (1998). Software engineering across computing curricula. ITiCSE '98, Dublin, Ireland. Retrieved Sept. 2008 from http://www.dimap.ufrn.br/~cccc/reforma/se_curr.pdf
- Shaw, M. (2000). Software engineering education: A roadmap. In A. Finkelstein (Ed.), *The future of software engineering* (pp. 373-380). A CM.

Assessment methods:

- Individual Essay, Group presentation, Examination

Resources

- Nvivo, Mendeley, EndNote, SmartPLS3, SPSS, Amos

Modeling Tools

- Dashboards, Sisense, Tableau, Microsoft Power BI, SAP Crystal Report, Weka, R

5.0 Language of Instruction

The language of instruction is English Language. There will be translations for students from French-speaking countries.

5.0 Quality Assurance

The development of the courses is on-going. These and other new courses to be developed will be monitored internally by course coordinators and programme leaders. While external course assessors and editors will be maintained to obtain good quality products.

6.0 Quality Assurance

The development of the courses is on-going. These and other new courses to be developed will be monitored internally by course coordinators and programme leaders. While external course assessors and editors will be maintained to obtain good quality products.

7.1 Staffing Position

The National Open University of Nigeria has chosen to operate on small academic faculty Staff supported on the field by Instructional Facilitators who are situated at the various Study Centres of the University. This should greatly improve quality.

To commence this programme, the Department has the following academic staff to man the programme.

It is envisaged that additional academic staff would be appointed as the years go by. They would be responsible for a whole range of activities of *Learning and Tutoring*: admission of students into the programme; registration of students into the programme; recruitment of facilitators; editing of course materials, development of some course materials, proof reading of galleys for printed course materials; preparation of the Semester examinations, and Coordination of the marking of examination answer scripts.

7.2 Admission and Registration Procedure (<https://acetel.noun.edu.ng>)

One of the determinants of the quality of education provided is the quality of the admitted students. The procedure of admission would be based on academic qualifications, in as much as it satisfies the minimum academic qualification prescribed by the NUC and in some cases with the appropriate regulatory professional body. A possible unintended fall out of the admission process may be an opportunity during the registration exercise where some formal interaction with the would-be students will be possible.

Generally admission process should be conducted in a flexible way to allow more students to have access to university education. This would, particularly, be in line with the individualisation of ODL concept. Cross-checking of relevant documents submitted would be carried out immediately to avoid future embarrassment.

7.3 Instructional Method and Delivery

The mode of instruction is by distance/learning mode. Students are to study essentially on their own by creating their own convenient learning environments. Face to face tutoring would only be handled by Instructional Facilitators at designated Study Centres for specified periods based on credit loading of the course. The Programme will consist of Theory courses, Practical sessions and Research project. For practical courses, the practical sessions would be held at designated laboratory centres across the country. Assessment for all courses will be by Tutor-Marked Assignments (TMAs) and end of Course examinations.

The Course Materials to be used in this programme would either be adopted and/or adapted from the Course Materials acquired from similar Open and Distance learning universities. The instructional methodologies adopted in the Faculty of Sciences and which would be used for this programme, include the use of specially designed and packaged print materials. Future use of video and audiotapes, radio and television broadcast, CD-ROM and the Internet to complement the print materials are in the pipeline.

7.4 Evaluation

Evaluation of each of the **theory courses** would consist of Tutor Marked Assignments and End of Course examination. The TMA constitutes 30% of the total score. The End of Course examination is 70%. **For practical courses**, a practical component is introduced for scores

achieved during the practical classes. This constitutes 40% of the total score. The TMA for practical courses is 30% and the End of course examination constitutes 40% of the total score.

7.4.1 Tutor Marked Assignments: As part of the evaluation mechanism, each course would be provided with 4 TMA's out of which the best 3 would be used for the Continuous Assessments for a course. To qualify to sit for examination therefore, each student must turn in at least three TMA's for the different course types.

7.4.2 End of Term Examination: Each course will also be examined at the end of the semester. Course facilitators would be encouraged to provide data bank questions to the examination data bank in the Centre. Course coordinators and Programme leaders of the Faculty of Sciences and Technology who are experts in the various course areas would be given the task of selecting two sets of question papers to conform to a particular *house style* and *format* provided by the SST Board of Examiners. Thereafter the questions would be internally moderated by the Dean and in some cases, other staff members, before they are sent to an External Assessor for moderation. The External Assessor would be chosen from a tertiary institution.

7.4.3 Marking of Examination Scripts: The marking guides for each course as moderated by the external assessor would be used in the marking of the scripts by the Course Facilitators.

7.5 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 takes place presently at the various Study Centres with student Counsellors and Facilitators. The Faculty of Sciences on her own part, will take steps to enhance study facilitation by providing practical facilities for her practical based courses in selected centres and employ more facilitators/demonstrators.

7.0 Recognition

Find attached the comments of the External Assessor and Reviewer. After the approval of Senate, the Faculty shall seek the approval of the Academic Planning Programme unit of the National Universities Commission, Abuja.

8.0 Proposed Starting Date and Presentation Schedule

The programme is already on offer as part of the first set of programmes approved for the university. It runs on Semester basis as approved by the University Senate.

9.0 Target Students

The MSc. Management Information Systems programme is intended for all candidates who are keen on developing their career path in any specialised area of the management of information systems.

Conclusion

As an attractive and career-oriented programme, graduates of the MSc. Management Information Systems programme are potential candidates for supervisory and management positions in established Management Information Systems unit as well as ICT departments of various corporate organisations and institutions. Opportunities also abound for successful graduates to embark on further studies at the PhD level.

Doctor of Philosophy Programmes

2.1.4 Doctor of Philosophy (PhD.) Artificial Intelligence

Name of the Programme: Doctor of Philosophy (PhD.) Artificial Intelligence with Specialization in either of the following:

- Natural Language Processing.
- Intelligent systems: Machine Learning, Neural Networks, data mining, pattern recognition, bioinformatics, semantic image analysis and natural intelligent systems, Deep Learning and Reinforcement Learning Computational Intelligence, Optimisation, Constraint Programming.
- Robotics

1.1 Programme Code: 6113

Entry Requirements

Candidates for Ph.D. admission must satisfy the following conditions:

- Candidates must have five credit passes including English, Mathematics and two other relevant science subjects at 'O' Level.
- Candidates with Bachelor's degree from an approved university must obtain a minimum of second class lower division with a CGPA of 3.5/5.0.
- Candidates must have Academic Master's degree in relevant areas with a CGPA of 3.5/5.0 and thesis score not lower than 60% (B). Ideally, a Master's degree in Machine Learning or a closely related topic.
- All applicants are expected to be competent with programming and have a strong mathematical background.
- Students should first contact a potential supervisor from the list of facilitators, their interest and ask whether they would be potentially willing to supervise a project.

Holders of equivalent qualification/experience specified for the course recognized by the Senate may be considered for admission

2.0 Duration of Programs

The Programme minimum duration is 6 semesters and maximum of 12 semesters.

3.0 Course Work Requirements

The Ph.D. degree programme is an intensive research work, whose aim is for the student to, at the end of the programme, make original contribution to existing knowledge. Ph.D. students are to take 18 units' core courses in their first year of study. The pass mark for all examinable courses is 50% and in any semester in which the CGPA falls below 3.00, the student will be advised to withdraw from the programme.

4.0 Graduation requirements

- ix. The student must earn a minimum of 30 credit units including thesis
- x. The student must present three seminars before the final defence
- xi. The student is expected to publish at least in a reputable peer reviewed conference proceedings and journal

5.0 Aim and Objectives

The Ph.D. Artificial Intelligence programme with specialization in Natural Language Processing, Intelligent systems and robotics is aimed at students that are passionate about the potential for AI to transform science, society or industry. We expect graduates from the programme to be world leaders in creating new AI technologies, with roles as research leaders in industry or academia, or as AI entrepreneurs shaping the new economy in Africa and the world at large.

5.1 Aim

The aim of the program is to cultivate individuals with a higher insight to computing and creativity to actualize solutions that will contribute to the society.

5.2 Objectives

Our goal is to train candidates to become innovation and research leaders in responsible, data-driven and knowledge-intensive AI systems with the following objectives:

- To acquire an advanced technique of Artificial Intelligence that will aid in designing a constructive solution to complex real-world problems.

- To produce qualified researchers and technical developers in the field of Artificial Intelligence.
- To prepare students with the knowledge to disseminate research materials through peer-reviewed scientific publications both local and international.
- To equip students with the ability to lead research teams in various disciplines of Artificial Intelligence.

Programme Structure and Degree Rules

6.0 Outline of Course Structure

Course Code	Course Title	Credit Unit	Status
ATI901	Research Methodology I	3	C
ATI902	Data Science	3	C
ATI903	Advanced Programming for AI	3	C
ATI904	Research Methodology II	3	C
SCI801	Management and Entrepreneurship	2	C
SCI802	ICT and Research Methodologies	2	C
GST907	Study Guide for Distance Learning	2	E
SCI803	Emerging Technologies	2	E
SCI804	Science, Environment and Innovation	2	E

ATI909	Advanced Natural Language Processing	2	E
ATI911	Advanced Machine Learning	2	E

The PhD. Artificial Intelligence programme is structured into 6 semesters as presented in the tables shown below:

1ST SEMESTER

Course Code	Course Title	Credit Unit	Status
ATI901	Research Methodology I	2	C
ATI903	Advanced Programming for AI	3	C
SCI801	Management and Entrepreneurship	2	C
	*Students are required to take one elective	2	E
Total		9	

ELECTIVES- 1ST SEMSTER

Course Code	Course Title	Credit Unit	Status
ATI909	Advanced Natural Language Processing	2	E
SCI803	Emerging Technologies	2	E
GST907	Study Guide for Distance Learners	2	E

2nd SEMESTER

Course Code	Course Title	Credit Unit	Status
ATI902	Data Science	3	C
ATI904	Research Methodology II	2	C
SCI802	ICT and Research Methodologies	2	C
	*Students are required to take one elective	2	E
Total		9	

ELECTIVES- 2nd SEMESTER

Course Code	Course Title	Credit Unit	Status
SCI804	Science, Environment and Innovation	2	E
ATI910	Advanced Machine Learning	2	E

3rd SEMESTER to 6th SEMESTER

Course Code	Course Title	Credit Unit	Status
ATI909	Thesis	12	C

Total Core (7+7+12=26) **Total Elective** (2+2=4)

*Students who have not taken the SCI course at MSc must take all SCI courses. This may increase the total credit load.

Notes:

- i. SCI803 and SCI804 are required courses for student who have not taken them at the Master's level
- ii. GST907 is compulsory for students who have not studied under ODL

All students of the PhD. Artificial Intelligence programme are required to obtain a minimum of 30 credit units

DETAILED COURSE CONTENT SPECIFICATION

ATI901Research Methodology I

The course aims at introducing students to the basic concepts used in research, scientific research methods and their approach. Thus, the course will develop a research orientation and acquaint students with the fundamentals of research methods. Topics include; Introduction to research; Philosophies and the language of research theory building; Thinking like a researcher (Understanding Concepts, Constructs, Variables, and Definitions); Problems and Hypotheses (Defining the research problem, Formulation of the research hypotheses, The importance of problems and hypotheses); and Research design (Experimental and Nonexperimental research design, Field research, and Survey research)

Recommended Readings:

- Bryman, Alan & Bell, Emma (2011). *Business Research Methods* (Third Edition), Oxford University Press. 3
- Kerlinger, F.N., & Lee, H.B. (2000). *Foundations of Behavioural Research* (Fourth Edition), Harcourt Inc.

ATI903Advanced Programming for AI

This course will provide advanced knowledge of both theoretical and practical programming in Python, with particular regard to the scientific programming environment. Algorithmic complexity, Data structure, CodeSkulptor development environment and other advanced development environments

Advanced features of python programming.

Recommended Readings:

- Dan Bader Python, *Tricks: A Buffet of Awesome Python Features*, (dbader.org, 2017)
- Luciano Ramalho, *Fluent Python: Clear, Concise, and Effective Programming*
- Tarek Zaide, *Expert Python Programming*

ATI902Data Science

Students will be taken through the techniques for discovering insights from massive amounts of structured and unstructured data to help shape or meet specific needs and goals. The course will demonstrate data analytics to drive decision-making and lean on automation and machine learning as core components of Artificial Intelligence Topics included: Multivariate Data Analysis, OMICS Data and Bioinformatics Algorithms, Nonparametric Data Analysis, Financial Data Analysis, Data Compression and Modeling, Data and Visual Analytics, R for Data Science, Dimensionality reduction, Big Data Integration and Analytics, IoT Analytics, Data Mining Algorithms In R

Recommended Readings:

- Ian H. Witten & Eibe Frank, *Data Mining: Practical Machine Learning Tools and Techniques*, 2005
- Mohammed J. Zaki & Wagner Meria Jr., *Data Mining and Analysis: Fundamental Concepts and Algorithms*

- Jeff Leek, *The Elements of Data Analytic Style*
- Mike Barlow, *Real-Time Big Data Analytics: Emerging Architecture*, 2013
- Scott Murray, *Interactive Data Visualization for the Web*, 2013

ATI904 Research Methodology II

This course is an advanced class to research methodology I. Topics to be covered include; Methods of data collection (Secondary data collection methods, qualitative methods of data collection, and Survey methods of data collection); Sampling techniques; Processing and analysis of data; Ethical issues in conducting research; Report generation, referencing and report writing.

Recommended Readings:

- Anantasi, A. & Urbina, S. (2004). *Psychological Testing*, Pearson Education, Inc.
- Chawla, Deepak & Sondhi, Neena (2011). *Research methodology: Concepts and cases*, Vikas Publishing House Pvt. Ltd. Delhi.

ATI909 Advanced Natural Language Processing

NLP is the study of human language from a computational perspective as such students will be guided through deep learning models and neural networks to solving challenging natural language analysis problems and its limitations. Topics Included: Language Models, Information theory, multinomials, Log-linear Models, Neural Models. LM Applications, Convolutional neural networks, recurrent neural networks (RNN): including LSTM, GRU, sequence to sequence RNN, bidirectional RNNs, generative adversarial networks, and memory neural networks.

Recommended Readings:

- Michael Nielsen, *Neural Networks and Deep Learning*, 2015
- Dan Jurafsky and James H. Martin. *Speech and Language Processing (3rd ed. draft)*
- Jacob Eisenstein. *Natural Language Processing*
- Yoav Goldberg. *A Primer on Neural Network Models for Natural Language Processing*
- Ian Goodfellow, Yoshua Bengio, and Aaron Courville. *Deep Learning*

ATI910 Advanced Machine Learning

This course introduces and discusses advanced topics in machine learning. Students will delve into the role of pattern analysis and probabilistic modeling, together with the mathematical techniques that will enable them to be able to solve real-world machine learning tasks: from data to inference. Topics Included: Statistical Machine Learning Theory, Analysis and Evaluation of Statistical Models, Analysis of Data, Supervised Learning - Artificial Neural Networks, Supervised Learning - Kernel Methods, Unsupervised Learning – Clustering, Unsupervised Learning - Topic Modeling, Feature Engineering, Missing Data, Basic Reinforcement Learning, Basic Semi-Supervised Learning

Recommended Readings:

- Yoshua Bengio, *Learning Deep Architectures for AI*, 2005
- Csaba Szepesvari, *Algorithms for Reinforcement Learning*, 2009
- David Barber, *Bayesian Reasoning and Machine Learning*, 2014
- Ian H. Witten & Eibe Frank, *Data Mining: Practical Machine Learning Tools and Techniques*, 2005
- Yoshua Bengio, Ian J. Goodfellow, & Aaron Courville, *Deep Learning*, 2015

ATI 909 Ph.D. Dissertation

- The primary requirement of the Ph.D. student is to do original and substantial research. This research is reported for review in the Ph.D. dissertation.
- There are three milestones for a dissertation: 1) passing the qualifying exam; 2) writing and successfully defending a thesis proposal; 3) writing and successfully defending a thesis. These are detailed below.
- Thesis advisors for the ML Ph.D. can be any of the participating faculty, regardless of whether they are in the same unit as the student.
- Qualifying Exam-The purpose of the Qualifying Examination is to judge the candidate's potential as an independent researcher.

GST807: STUDY GUIDE FOR DISTANCE LEARNING (2 UNITS)

Introduction to the Open and Distance Learning (ODL) System: History of the Open and Distance Learning System, Characteristics of the Open and Distance Learning System, Teaching and Learning in the Open and Distance Learning System. Study Skills for the Distance Learner: Listening, Speaking, Reading, Writing, Study Strategies. Assessment and Evaluation Modes in Open And Distance Learning (ODL): Overview of Assessment in ODL, Instructional-Based Assessment Modes, Semester Examination, Assessment of Non-Examinable Courses. Learners' Support Services: Definition and Purposes of Learners' Support Services, Types of Learners' Support Services, Sources of Learners' Support Services, Benefits of Learners' Support Services.

Recommended Reading

- COTTRELL, S., 2003. The Study Skills Handbook. 2nd Edition .Basingstoke: Palgrave.
- LEE-DAVIES, L. and BAILEY, S., 2007. Developing work and study skills. [electronic resource]. London: Thomson Learning.

Assessment methods:

- Group Essay, Seminars, Group presentation, Examination

2.1.5 Doctor of Philosophy (PhD.) Cyber Security

1.0 Introduction

The Africa Centre of Excellence on Technology and Enhanced Learning (ACETEL) is a world Bank funded centre established 2019, at National Open University of Nigeria (NOUN). The doctorate (D.Sc.) program in cybersecurity prepares the most highly qualified cybersecurity professionals to lead the increasingly complex cyber challenges of the digital world in which we live and to protect the infrastructures that are critical to the nation's digital society and economy. Graduates will educate and lead the next generation of cybersecurity professionals to solve the most complex cybersecurity problems of tomorrow.

1.1 Philosophy

To build national and regional capacity through theoretical and practical cyber security science leading to advancement in Information and Communication Technology (ICT), minimize cybercrime and develop high level expertise for economic development.

1.2 Scope

Cyber security is an evolving field; it has gone beyond network security. Our doctoral program recognizes the evolving field and has an emphasis on the intersection of technology, management, ethics, leadership, policy, teaching, and data science aspects of cyber security.

1.3 Main Focus on Applied Research

Our focus is on working practitioners in the field, extending the knowledge base of the cyber security profession in an environment of scholarly inquiry based on real-world situations, reflecting the changing nature of the maturing cybersecurity field. The students will perform extensive applied research in the technology, societal, ethical, and

policy domains within cybersecurity. The research will consider the evolution of threats and their mitigation in the 21st century and prepare graduates to be leaders and educators while allowing individuals to foster their unique backgrounds, strengths, and interests in their chosen careers.

2.0 Objectives

1. To provide graduates with solid foundation in Cyber Security Science.
2. To provide and promote sound practical and theoretical training in cyber security hardware, software, and application areas, that will make our graduates useful in both private and public sectors of the economy.
3. To develop the students for the purpose of self-employment
4. To promote the career opportunities offered by Cyber Security Science and to meet with the ongoing needs of the industry.

2.1 Competencies of Graduates

At the end of a successful completion of the Ph.D. in Cyber Security programme, our graduates should have the following abilities to:

1. Analyse cyber security problem, identify and define the requirements appropriate to its solution.
2. Analyse the impact of cyber security on individuals, organizations, and society.
3. Design, implement and evaluate a cyber security-based system, process, component, or program to meet the desired needs.
4. Apply mathematical foundations, algorithmic principles, and cyber security science theory in the modelling and design of security-based systems in a way that demonstrates comprehension of the trade-offs in design choices.
5. Develop Cyber Security based entrepreneurial skills to thrive in this ICT age.

4.0 Duration of Programs

The Programme minimum duration is 6 semesters and maximum of 12 semesters.

5.0 Course Work Requirements

The Ph.D. degree programme is an intensive research work, whose aim is for the student to, at the end of the programme, make original contribution to existing knowledge. Ph.D. students are to take 18 units' core courses in their first year of study. The pass mark for all examinable courses is 50% and in any semester in which the CGPA falls below 3.00, the student will be advised to withdraw from the programme.

6.0 Graduation requirements

- i. The student must earn a minimum of 32 credit units including thesis
- ii. The student must present three seminars before the final defence
- iii. The student is expected to publish at least in a reputable peer reviewed conference proceedings and journal

6.0 Outline of Course Structure

The PhD. Cyber Security programme is structured into 6 semesters as shown below:

First semester

Course Code	Course Title	Credit Unit	Status
CST901	Advanced Computer and Network Security	3	Compulsory
CST903	Advanced Cryptography	3	Compulsory
CST905	Malware Analysis	2	Compulsory
CST921	Research Methodology	2	Compulsory
Total Credit Units		10	

* GST807 is required for students who have not enrolled in Distance Learning before

Second Semester

Course Code	Course Title	Credit Unit	Status
CST902	Digital Forensics and Incident Response	3	Compulsory
CST904	Monitoring, Auditing, and Penetration Testing	3	Compulsory
CST906	Cyber Threat Intelligence	2	Compulsory
CST922	Seminar	2	Compulsory
Total Credit Units		10	

Third Semester to Sixth Semester

Course Code	Course Title	Credit Unit	Status
SCT999	Thesis	12	Compulsory
Total Credit Units		12	

7.0 Course Descriptions

CST901: ADVANCED COMPUTER SECURITY (3 UNITS)

An advanced study of computer security which will cover threat and security policy models, authentication mechanisms, authorization techniques, security models, trusted computing, network architecture security and security protocols, operating system security, database security, physical security, Web security, distributed system security and cryptography.

CST902: DIGITAL FORENSICS AND INCIDENT RESPONSE (3 UNITS)

Presents the evolution of digital forensics with emphasis on investigative methods and models, peculiarities of Windows, Linux and Mac OS, guidelines and standards of digital forensics, cloud computing forensics, open source intelligence techniques for digital forensics, and digital forensics of emerging technologies such smart devices, virtual reality and social media.

CST903: CRYPTOGRAPHY (3 UNITS)

This covers symmetric and asymmetric cryptography including the history of cryptography and cryptanalysis, algorithms for modern ciphers such as AES, DES, RSA, and RC4, key exchange and management, digital signatures, secure hashes, as well as steganography.

CST904 MONITORING, AUDITING, AND PENETRATION TESTING (3 UNITS)

This course examines industry best practices for identifying system vulnerabilities, threats and preventing attacks on organisational level. It includes risk assessment, security assessment, network and perimeter auditing, web application auditing, reporting and ethical hacking.

CST905 MALWARE ANALYSIS (2 UNITS)

This course covers behavioural and code analysis of malware, tools and techniques for malware analysis, dynamic and static analysis, network monitoring, cybersecurity defences and developing policies for malware, handling.

CST922 SEMINAR (2 UNIT)

Literature study, writing up and oral presentation of a topic on an aspect of Cyber Security as approved by the Centre.

CST908 CYBER THREAT INTELLIGENCE (2 UNITS)

This covers intelligence foundation, lifecycle, attack, defence and tools; cyber threat intelligence landscape including tactical, operational and strategic dimensions and threat intelligence maturity model. It includes techniques gathering intelligence for open source, social media and mobile apps, counter-intelligence methods and attribution.

CST921: RESEARCH METHODOLOGY (2 UNITS)

This course should cover formulation of research problem, techniques, research tools, Principles of Scientific Research, Concepts of Hypotheses Formulation and Testing, Organization of Research and Report Writing.

CST999 THESIS (12 UNITS)

Students will be expected to carry out a research in a relevant area of Cyber Security and submit a report with significant contribution in cyber security. The thesis should lay much emphasis on the application of Cyber Security in the society.

LABORATORY REQUIREMENTS

See attached

REFERENCE

1. Federal University of Technology, Minna. Cyber Security Science Department curriculum.
2. Computer Systems Security. MIT open courseware.

3. *ACM/IEEE/AIS SIGSEC/IFIP Cybersecurity Curricular Guideline*
4. A Report in the Computing *Curricula* Series. Joint Task Force on *Cybersecurity Education*. Association for Computing Machinery (ACM). *IEEE*

2.1.6 Name of the Programme: PhD Management Information Systems

Programme Code:

2.0 Entry Requirements

Candidates seeking for admission into the Ph. D. degree programme must satisfy the following general and specific requirements.

- 2.1** Satisfy the minimum five (5) credits requirement for admission into the postgraduate programme including English and Mathematics.
- 2.2** Holders of a Master degree (M.Sc., M.Tech., M.Phil, or equivalent) in Cyber Security Science/Computer Science from National Open University of Nigeria or from any other University recognized by the Senate of National Open University of Nigeria with a minimum CGPA of 3.50 on a scale of 5.00 or weighted average of 60% or an average of performance of “B” grade.
- 2.3** Holders of equivalent qualification/experience specified for the course recognized by the Senate may be considered for admission.

3.0 Duration of Programs

The Programme minimum duration is 6 semesters and maximum of 12 semesters.

4.0 Course Work Requirements

The Ph.D. degree programme is an intensive research work, whose aim is for the student to, at the end of the programme, make original contribution to existing knowledge. Ph.D. students are to take 18 units’ core courses in their first year of study. The pass mark for all examinable courses is 50% and in any semester in which the CGPA falls below 3.00, the student will be advised to withdraw from the programme.

5.0 Graduation requirements

- iv. The student must earn a minimum of 32 credit units including thesis
- v. The student must present three seminars before the final defence
- vi. The student is expected to publish at least in a reputable peer reviewed conference proceedings and journal

6.0 Aims and Objectives

The PhD. Management Information Systems programme is designed to prepare graduates in the theory and practice of MIS in the areas of management, information systems and technology. Graduates are expected to engage in teaching and research careers involving the design, analysis, implementation and operation of computer-based information systems and other associated organization and economic issues.

6.1 Aims

The PhD Management Information Systems programme is designed to prepare students for teaching and research careers involving the design, analysis, implementation and operation of computer-based information systems and other associated organizational and economic issues. It gives students the ability to perform critical analysis of existing work, and to undertake research studies to advance academic understanding in the MIS field in the course of their Ph.D. studies and in their subsequent career.

6.2 Objectives

The objectives of the postgraduate MIS programmes are to:

- i. To produce high level manpower in MIS through the acquisition of requisite skills and knowledge, for national development.
- ii. To develop in MIS graduates a sense of inquiry, capacity for independent research and motivation to extend the frontiers of MIS technology.
- iii. To produce graduates who will be adequately equipped for relevance in the global knowledge economy.
- iv. To produce graduates who are capable of applying appropriate MIS principles for solving problems for the promotion of human well-being.
- v. To produce manpower with optimal competencies and skills to function effectively in the

academia and the private sector.

7.0 Programme Structure and Degree Rules

7.1 Outline of Course Structure

Courses for the PhD Management Information Systems programme are tailored towards Business Intelligence and Analytics, a data-driven decision support area, that is increasingly gaining prominence in supporting better business decision making.

1ST SEMESTER

Course Code	Course Title	Credit Unit	Status
MIS901	Web Computing and Mining	3	Core
MIS903	Business Intelligence	3	Core
MIS905	Research Methodologies	2	Core
MIS919	Seminar	1	Core
Total		9	

2ND SEMESTER

Course Code	Course Title	Credit Unit	Status
MIS902	Systems Security Management	3	Core
MIS904	Data Mining for Business Intelligence	3	Core
MIS906	Research Topics in Business Intelligence	2	Core
MIS920	Seminar	1	Core
Total		9	

Notes:

- i. SCI801 and SCI802 are required courses for student who have not taken them at the Master’s level
- ii. GST807 is compulsory for students who have not studied under ODL

3RD SEMESTER

Course Code	Course Title	Credit Unit	Status
MIS999	Thesis	12	Core
Total		12	

All students of the PhD Management Information Systems programme are required to obtain a minimum of 12 credit units of coursework and 12 credit units of thesis.

DETAILED COURSE CONTENT SPECIFICATION

GENERAL COURSES

All postgraduate students (irrespective of the programme) must take Management and Entrepreneurship (SCI801) as well as ICT & Research Method (SCI802) as compulsory courses. However, any student who has taken them at a particular postgraduate level is exempted at higher levels. Student who have not studied through ODL (at any level) are required to take GST807-A Study Guide for the Distance Learner.

CORE COURSES

MIS901—Web Computing and Mining (3 Credit Units)

This course introduces data structures and algorithms that are suited for developing Internet-based information systems in business intelligence, search engines, digital libraries, knowledge management systems, web/data/text mining, national security and biomedical informatics. The course contains lectures, readings, programming assignments, lab sessions and a large-scale hands-on system development project. The course will begin with select fundamental yet useful data structures (e.g., stacks, queues, lists, trees and graphs) and sorting and searching algorithms. Newer and more robust web/data/text mining algorithms (e.g., neural networks, decision trees, genetic algorithms, spreading activation, information retrieval, natural language processing) are then introduced in the context of modern and emerging information systems in business, engineering and bioinformatics.

MIS902 Systems Security Management (3 Credit Units)

The information security arena contains a broad array of multi-level models for assessing, planning, implementing and monitoring the mitigation of security risks. At the very core of this information security spectrum are the actual system and network devices which store, manage, transmit and secure information. Areas to be covered include: risk assessment; operational issues, planning, and design. proper safeguarding of operating systems and related components: issues and techniques, Other areas are covered around Information Assurance topics such as Security policy, international conflict, and cyber warfare, Security and privacy in online social networks, mobile and web security, security applications of program analysis, botnets and malware analysis, Hardware and software system vulnerabilities. This course offers a solid base for system administrators and technical managers.

Learning Resources:

Seminars, E-books, System Security Journal

Recommended Reading

- Matt B. (2003). *Computer Security: Art and Science*. Addison-Wesley (ISBN: 0-201-44099-7),
- McGraw, Gary. (2006). Software Security: Building Security In. IEEE Security & Privacy. 2. 6. 10.1109/ISSRE.2006.43.
- Prislán, Kaja & Lobnikar, Branko & Bernik, Igor. (2017). Information Security Management Practices: Expectations and Reality. 10.18690/978-961-286-114-8.1.
- Pistoia M., Logozzo F. (2007) Program Analysis for Security and Privacy. In: Südholt M., Consel C. (eds) Object-Oriented Technology. ECOOP 2006 Workshop Reader. ECOOP 2006. Lecture Notes in Computer Science, vol 4379. Springer, Berlin, Heidelberg
- Chakraborti, Subhamoy & Acharjya, Debi & Sanyal, Sugata. (2015). Application Security framework for Mobile App Development in Enterprise Setup. International Journal of Advanced Networking and Applications. 06.
- Kata Rebeka Szűcs & Regina Zsuzsánna Reicher, 2017."Mobile Application Security," Volume of Management, Enterprise and Benchmarking in the 21st century IV,
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Assessment Methods

MIS903 Business Intelligence (3 Credit Units)

The objective of this course is to give students a broad overview of managerial, strategic and technical issues associated with Business Intelligence and Data Warehouse design, implementation and utilization. Areas to be covered include: the principles of dimensional data modeling, techniques for extraction of data from source systems, data transformation methods, data staging and quality, data warehouse architecture and infrastructure and the various methods for information delivery. Critical issues in planning, physical design process, deployment and ongoing maintenance will also be examined. Students will learn how data warehouses are used to help managers successfully gather, analyze, understand and act on information stored in data warehouses. Others areas around components and design issues relating to data warehouses and business intelligence techniques for extracting meaningful information from data warehouses will be emphasized. The course will use state-of-the-art data warehouse and OLAP software tools to provide hands-on experience in designing and using Data Warehouses and Data Marts. Students will also learn how to gather strategic decision making requirements from businesses, develop key performance indicators (KPIs) and corporate performance management metrics using the Balanced Scorecard, and design and implement business dashboards.

Learning Resources

Scholarly Articles, Slideshare presentation, E-books, Lab sessions

Recommended Reading

- Ponniah, P. (2010). *Data Warehousing Fundamentals for IT Professionals*: Second Edition. 10.1002/9780470604137.
- Slideshare presentation on “Principles of dimensional modelling” (<https://slideplayer.com/slide/8637146/>)
- Humphries, Mark, et al. (1999). *Data Warehousing: Architecture and Implementation*. Prentice Hall. PTR
- Ken W. C (2011). *Agile Analytics: A Value-Driven Approach to Business Intelligence and Data Warehousing*. Addison-Wesley Professional
- Ralph Kimball and Margy Ross, (2013). "*The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling*," 3rd Edition, Wiley Computer Publishing, ISBN-13: 978-1118530801 | ISBN-10: 1118530802

Assessment Methods

- Online Lab Sessions, Online Activities, Performance Assessment & Evaluation using selected tool

MIS904 Data Mining for Business Intelligence (3 Credit Units)

This course will cover advanced micro-level data analytics, advanced data mining techniques to discover knowledge and acquire business intelligence from massive datasets, pattern recognition, including fraud detection, consumer behavior, credit approval etc. The course will also cover the most important data mining techniques—classification, clustering, association rule mining, visualization, prediction—through a hands-on approach using XL Miner and other specialized software, such as the open-source WEKA software.

Learning Resources & Tools

Scholarly Articles, Textbooks (E-Books), WEKA ‘open source’, Videos

Recommended Reading

- Vercellis, C. (2009). *Business intelligence: data mining and optimization for decision making*. New York: Wiley.
- Shmueli, G., Bruce, P. C., Yahav, I., Patel, N. R., & Lichtendahl Jr, K. C. (2017). *Data mining for business analytics: concepts, techniques, and applications in R*. John Wiley & Sons.
- WEKA Tutorial (<https://wekatutorial.com/>)

Assessment Method

Online Lab Sessions, Online Activities, Performance Assessment & Evaluation using selected tool

MIS905 Design Science Research Methodologies (2 Credit Units)

Introduces beginning doctoral degree students and advanced master's degree students to important research and survey articles in the field of management information systems.

Learning Resources

Scholarly Articles, Textbooks (E-Books)

Recommended Reading

- Hevner, A., & Chatterjee, S. (2010). *Design research in information systems: theory and practice* (Vol. 22). Springer Science & Business Media.
- Geerts, Guido L. (2011). “A Design Science Research Methodology and Its Application to Accounting Information Systems Research.” *International Journal of Accounting Information Systems*, vol. 12, no. 2, pp. 142–151., doi:10.1016/j.accinf.2011.02.004.
- Peffers, K., Tuunanen, T., Rothenberger, M., & Chatterjee, S. (2007). A Design Science Research Methodology for Information Systems Research. *Journal of Management Information Systems*,24(3), 45-77. Retrieved from <http://www.jstor.org/stable/40398896>

Assessment Method

Group Discussions, Presentations and Seminars

MIS906 Research Topics in Business Intelligence (2 Credit Units)

This course aims to explore topical and emerging issues in Business Intelligence Research. Topics to be covered include self-service business intelligence (reporting/analysis), reporting/analysis across multiple systems, unlocking data buried in systems, reducing cost of reports production, mobile business intelligence, replacing a business intelligence system.

MIS999 Thesis

A key element of the PhD programme is the research thesis. Students are expected to identify their research interest during the first year of course work and seminars. They are expected develop their research proposal and make a formal presentation of it to their respective departments. Students are required to defend their thesis before a panel of internal and external examiners.

Tasks assignment:

1. MIS901—Web Computing and Mining (3 Credit Units)—SBJ
2. MIS902 Systems Security Management (3 Credit Units)—SBJ
3. MIS903 Business Intelligence (3 Credit Units)—Dr. Dahiru
4. MIS904 Data Mining for Business Intelligence (3 Credit Units)—Nengi
5. MIS905 Design Science Research Methodologies (2 Credit Units)—Nebath
6. MIS906 Research Topics in Business Intelligence (2 Credit Units)—SBJ

5.0 Language of Instruction

The language of instruction is English Language. There will be translations for students from French-speaking countries.

6.0 Quality Assurance

The development of the courses is on-going. These and other new courses to be developed will be monitored internally by course coordinators and programme leaders. While external course assessors and editors will be maintained to obtain good quality products.

2.3 LIST OF ACADEMIC STAFF AND FACILITATORS

ACETEL has chosen to operate on academic Staff supported on the field by Instructional Facilitators to ensure quality in instructional delivery. Therefore, ACETEL has the following academic staff and facilitators to man the programmes:

2.3.1 ACADEMIC STAFF

S/N	NAMES	STATUS	QUALIFCATION
1.	Dr. Vivian Nwaocha	HOD/ Senior Lecturer	Ph.D. Computer Science (2017) , M.Sc. Computer Science (2006), PGD Computer Science and Engineering (2002), B.Eng Metallurgical and Material Engineering (1995)
2.	Dr. Muhtar H. Alhassan	Associate Professor	Ph.D., Computer Control Machines (1993, M.Sc. Engineering Industrial Automation (1982)
3.	Dr. S.O. Ajibola	Associate Professor	Ph.D. (Mathematics), M.Sc. (Mathematics), B.Sc., (Mathematics)
4.	Dr. Greg O. Onwodi	Senior Lecturer	Ph.D. Computer Science (2015), M.Sc. Information Technology (2004), B.Sc. Computer Science (1995)
5.	Dr. Juliana Ndunagu N.	Senior Lecturer	Ph.D. Computer Science (2009), M.Sc. Computer Science and Engineering (2001), PGDE Education (2008) , B.Sc. Mathematics (1986)

6.	Dr. Sadiq Sani	Research Specialist, AI & Machine Learning, British Telecoms, 2019 – date	BTech Computer Science Abubakar Tafawa Balewa University Bauchi 2001 - 2006. MSC Computing Information Engineering, Robert Gordon University, UK 2008 - 2010. PhD Artificial Intelligence, Robert Gordon University, 2010 - 2014. Research Fellow, Robert Gordon University, 2014 - 2019.
7.	Dr. Ismaila Idris		Cryptography, Malware and Digital Forensics, Machine Learning and Data Mining
8.	Dr. Kana Armand Donfack		Knowledge Representation and reasoning (Prefer ARTIFICIAL INTELLIGENCE)
9	Dr. Zareefa Mustafa		Cloud Forensics and Digital Forensics
10	Dr. Shafii .M. Abdulhamid		Cloud Computing Security, Soft Computing and IOT
11	Dr. John K. Alhassan		Artificial Intelligence, Internet Technology, Software Engineering, Database Management System, Data Mining and Computer Security
12	Dr. Ibrahim Adeyenju	Senior Lecturer (awaiting assessment to Reader effective Oct 2018) and Deputy Dean of Engineering at Federal University Oye Ekiti.	B. Tech. Computer Engineering with First class Hons (2004) - LAUTECH, MSc Computing Information Engineering with Distinction (2007) and PhD Computing with specialization in Artificial Intelligence (2011).
13	Dr. Adenrele Afolunso	Lecturer I	Ph.D.(2017), M.Sc. Computer Science (2006) B.Sc. Computer Science and Mathematics

			(1995)
14	Dr. Francis Osang	Lecturer I	Ph.D. ICT (2015), M.Sc., Information Technology B.Sc. Computer Science
15	Dr. Adewale Adesina	Lecturer I	Ph.D. Computer Science (20016), M.Sc., Computer science (1977) NCS (2003)
16	Dr. Aminu Muhammad	Senior Lecturer	BSc Computer Science, 2004 MSc Computing, 2007 PhD Computing, 2016

2.3.2 FACILITATORS

17	Prof. Francis Bakpo	Professor	Ph.D. Computer Science
18	Prof. Awodele Oludele	Professor	Ph.D. Computer Science
19	Prof. Adeyinka Adekunle	Professor	Ph.D. Computer Science
20	Prof. S. Sodiya	Professor	Ph.D. Computer Science
21	Prof. Nwojo N. Agwu	Professor	Ph.D. Computer Science
22	Prof. Davoc Choji	Professor	Ph.D. Computer Science
23	Prof. Greg. M. Wajiga	Professor	Ph.D. Computer Science
24	Prof. David A. Abayomi	Professor	Ph.D. Computer Science
25	Prof. O.B. Longe	Professor	Ph.D. Computer Science
26	Prof.. Virginia Ebere Ejiofor	XProfessor	Ph.D. Computer Science, M.Sc. Computer Science, B.Sc. Computer Science (First Class Honour)
27	Prof. U.O. Osisigbo	Professor	Ph.D., M.Sc., B.Sc. (Mathematical Physics)
28	Dr. GodsPower O. Ekuobase	Associate Professor	Ph.D. Computer Science,

29	Dr. Usman Babawuro	Associate Professor	Ph.D. Computer Technology
30	Dr. John A. Odey	Senior Lecturer	Ph.D. Computer Science
31	Dr. Alao Olujumi Daniel	Senior Lecturer	Ph.D. Computer Science
32	Dr. O. Osunade	Senior Lecture	Ph.D. Computer Science
33	Dr. Umezina Nnamdi C.	Facilitator	Ph.D. Information Technology
34	Dr. Agbonrofo Celestine	Facilitator	Ph.D. Mathematics
35	Dr. Boukari Souley	Facilitator	Ph.D. Computer Science
36	Dr. Adeniran J.O.	Facilitator	Ph.D. Mathematics
37	Dr. Adetumbe Adebayo O.	Facilitator	Ph.D. Computer Science
38	Dr. B.I. Tijjani	Facilitator	Ph.D. Physics
39	Dr. Ekechukwu B.C.	Facilitator	Ph.D. Computer Science
40	Dr. Falodum Sunday E.	Facilitator	Ph.D. Communication Physics
41	Dr. Folorunso Segun	Facilitator	Ph.D. Computer Science
42	Dr. Josiah Ahaiwe	Facilitator	Ph.D. Computer Science 08033527794
43	Dr. Peter Bamidele Shola	Facilitator	Ph.D. Computer Science
44	Dr. Sadia S.A.	Facilitator	Ph.D. Computer Science
45	Dr. Arinze S. Nwaeze	Facilitator	Ph.D. Computer Science
46	Dr. Ogwu Oliver	Facilitator	Ph.D. Computer Science
47	Dr. Owa Vivtor Korede	Facilitator	Ph.D. Computer Science
48	F.A.J. Bello (Dr.)	Facilitator	Ph.D. Maths/Statistics
49	Dr. Olabiyi Stephen	Facilitator	Ph.D. Mathematics
50	Omidiora E.O.	Facilitator	Ph.D. Computer Science
51	Dr. Fidelis O. Odema Chete	Facilitator	Ph.D. Computer Science

52	Dr. Benson Yusuf Baha	Facilitator	Ph.D. Computer Science
53	Dr. Oyebanji Omotayo	Senior Lecturer	Ph.D., Computer Science (1984), M.Sc., Computer Science (1981), B.Sc., (Computer Science (1976)

It is envisaged that additional academic staff would be appointed as the years go by. They would be responsible for a whole range of activities of *Learning and Tutoring*: admission of students into the programme; registration of students into the programme; recruitment of facilitators; editing of course materials, development of some course materials, proof reading of galleys for printed course materials; preparation of the Semester examinations, and Coordination of the marking of examination answer scripts.

PART 3: GRADE POINT AVERAGE (GPA) AND CUMULATIVE GRADE POINT AVERAGE (CGPA)

At the end of examinations, they are graded and scored. The raw scores are recorded and are weighted to produce a single point average for each of the courses registered for and for which students have written the Tutor Marked Assignments and Examinations.

3.1 Formula for calculation of GPA and CGPA

The Grade Point Average shall be calculated by multiplying the Grade Point (GP) attained in each course by the credit units for the course. The GPA of all the courses are added up and divided by the total number of credit units taken in a semester or session. The **GPA** is computed on semester by semester basis. The formula for calculating the GPA is the following:

$$\text{GPA: } \frac{\text{GPE}}{\text{TCC}} = \text{GPA.}$$

The cumulative grade point average is the Total Grade Point Earned (TGPE) divided by the Total Credits Carried (TCC). The **CGPA** is calculated at the end of two (2) or more semesters. The formula for calculating **CGPA** is the following:

$$\frac{\text{TGPE}}{\text{TCC}} = \text{CGPA}$$

KEY:

- TCC - TOTAL CREDIT CARRIED
- TCE - TOTAL CREDIT EARNED

TGPE - TOTAL GRADE POINT EARNED (CREDIT POINT X WEIGHTED GRADE POINT)
CGPA - CUMMULATIVE GRADE POINT AVERAGE
WGP - WEIGHTED GRADE POINT

3.2 GRADE POINTS

70 and above	-	A	-	5
60 - 69	-	B	-	4
50 – 59	-	C	-	3
45 - 49	-	D	-	2
40 – 44	-	E	-	1
39 and below	-	F	-	0

3.3 END OF PROGRAMME CLEARANCE

Upon the release of the graduation list, graduating students are required to undergo a clearance process as contained in the Centre website.

PART 4: ASSESSEMENT AND EVALUATION

4.1 Introduction

Assessment and Evaluation are the means by which students' learning outcomes are measured against the stated learning objectives for each course and programme. Three types of assessment are employed in NOUN:

(i) Self-Assessment exercises: These are exercises found within each study unit of the course materials. Although not graded, they are designed to help students assess their progress as they study.

(ii) Continuous Assessment: This type of assessment is designed to provide students an opportunity to assess their learning and progress over the duration of the course. The results constitute 30% of students' final score in a course.

(ii) End of Semester Examinations: As the name implies, semester examinations assess students on the entire course at the end of a semester. The examinations constitute 70% of students' total score in a course.

Note: Students must be duly registered for each course in the semester to be eligible for the continuous assessment and the End-of-semester examinations.

4.2 Tutor Marked Assignments (TMA)

Continuous assessments in NOUN are automated in the form of computer marked assignments and are administered online. This would take the form of projects, modelling, practicals as approved by ACETEL Academic Board. You can access the TMA portal at ACETELtma@noun.edu.ng/.

The TMA portal opens after course registration for the semester and it closes just before the examinations begin.

4.3 End-of-Semester Examinations

Two types of examinations are employed at the Centre of Excellence on Technology Enhanced Learning. They are the eExamination and the Pen-on-Paper (PoP) examinations. The examinations are conducted at the end of every semester at the Study Centres or any other location as may be arranged by the Centre. For undergraduate students, the examinations account for 70% of the total score for the course.

4.3.1 Pen-on-Paper (PoP) Examinations

PoP examinations are written a writing based examination administered in a face to face context to Masters and Ph. D. students. The number of questions per course is according to the credit units of a course. For a three (3) credit unit course, there are 5 questions of which four (4) must be attempted while for a 2 credit unit course, there are 4 questions of which three (3) must be attempted for the digital programmes.

4.3.3 Opening and Closing of Examination Portal

As it is for course registration, students must also register for examinations they wish to undertake. The portal for examination registration opens alongside the course registration portal. Students who do not register the examinations will not be allowed to write examinations in the relevant course.

4.4 Examination Procedures

Examinations are a very important component of a learning process. Therefore credibility and integrity of the processes must be maintained. Thus, there are policies, rules and regulations to guide the conduct of examinations.

4.4.1 Policies

Policies guiding the administration of examinations in NOUN include the following:

(i) Deferment of Examinations

In conformity with the provisions of Open and Distance learning (ODL), the University has set guidelines for the deferment of examinations and the conditions that warrant deferment thereof: For instance, students who wish to defer their examinations must apply well in advance instead of waiting until the end of semester when examinations are about to commence. These guidelines are laid out in the “**Policy on Deferment of Examinations**” (see Appendix V). Students are advised to read the document and acquaint themselves with the requirements for deferring their examinations or even courses.

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(ii) Remarketing of Scripts

The University has put a policy in place to guide requests for remarketing of scripts and re-computation of results. The provisions of this policy can be found on “**Policy of Re-Marking of Students’ Examination Scripts and Re-computation of Results**” For instance, a student who wishes to request for the re-marketing of his/her script(s) must appeal within 30 days from the date of publication of the results. There is a fee per course for this service (see Appendix VI). Students should familiarise themselves with the procedures before making requests for the remarketing of their scripts.

(iii) Examination Rules and Regulations

There are laid down rules and regulations guiding the end- of -semester examinations. Students are advised to read these rules carefully before they proceed to write any examination as examination misconduct is taken very seriously in NOUN and strict disciplinary measures have been put in place for defaulters (see Examination Rules and Regulations in appendix VII).

(iv) Examination Misconduct

Malpractice refers to any breach of the Matriculation oath. Examples of examination malpractice are: cheating, fighting, impersonation, verbal or physical attack on lecturer(s)

and staff. Examination malpractice is regarded as a very serious offence by the university and so it attracts high sanctions. The penalty ranges from a warning to outright expulsion. Students are advised to desist from all forms of examination misconduct.

4.5 Disciplinary measures for Examination Malpractice

The punishment for examination malpractice is premised on a decree promulgated by the Federal Government on Examination Malpractices in 1999. The main sections and points of the decree which every student should be familiar with are contained in the NOUN General Catalogue (2104-2017) and have been reproduced in Appendix VIII.

PART 5: LEARNER SUPPORT SERVICES

5.1 Introduction

Learner support refers to the facilities and services that the institution makes available to facilitate students' learning. The facilities which include eLibraries, laboratories and eLearning platform are designed for you to meet physically and virtually, study, socialise and work collaboratively regardless of your location.

5.2 Facilitation

5.2.1 Introduction to ACETEL eLearning Platform

NOUN is leveraging on the advancements achieved in Information Communication Technology (ICT) by using technology to mediate the distance between students and teachers who are tutorial facilitators in a distance learning and eLearning context. ACETEL eLearning platform that is designed to enable student learn at their own pace and location. The platform has several features such as course content in e-book and video formats, online class discussions, general forum for interaction among peers, facilitation for interaction with tutorial facilitators, and assessment for practice quizzes, tests and assignments.

The course materials for the programmes in ACETEL are available on the platform in e-book format for students. This is accessible on smart phones, notepads, or any system that uses safari, iOS, chrome or internet explorer. There is an introductory demo to the elearning platform that shows students how to use the platform. Students are encouraged to visit the eLearning platform and register at www.acetelnoun.edu.ng.

5.2.2 Tutorial Support

The facilitation feature on the platform enables facilitators to interact with students through several features such as online class discussions, general forum, and assessments.

Facilitation procedure: Students are expected to ask questions about aspects of the course content that may not be clear; participate in online class discussions initiated either by the facilitator or their peers; and assess their understanding through practice quizzes provided by tutorial facilitators on the eLearning platform.

Role of Students: As distance learners, students are responsible for their learning. The course materials are designed for interactive and self-instructional learning. Students are

therefore expected to study their course materials before interacting with their tutorial facilitators and peers on the eLearning platform.

Role of Facilitators: The tutorial facilitators comprise academic staff of the Centre and other tutorial facilitators that have qualifications that are comparable with lecturers in conventional universities. These facilitators are available to guide students through the course content towards achieving their learning goals. Students are encouraged to interact with their facilitators on the platform.

5.3 Library Services

Centre of Excellence on Technology Enhance Learning has a standard and well equipped library at the Headquarters in Lagos as well as an online eLibrary known as “[Information Gateway](#)” to support teaching, learning, and research activities of the university. Its major aim is to facilitate access to scholarly resources that will enrich in students’ learning. The main hub of the Library is located at the headquarters of the University, while each study centre also has a library. The ACETEL Library has both print and electronic resources. The electronic resources from the e-library of University will help you in your studies, research in pursuit of scholarship. Each resource provides very helpful tools to assist you navigate through the contents.

5.4 Language Services

The Centre will leverage on the language laboratory facilities for English and French located at the Faculty of Arts to solve language problems the students might face. The services of English and French Faculty members would be involved to assist the students in developing deep understanding of the two languages. The centre will also utilize the facilities at that Visitors Information & Call Centres (VICC) Unit of the University to interpret course into French and English languages and during the language training for the students.

5.4 Information Communication Technology (ICT)

ACETEL has the ICT Unit that demonstrates the significant role that ICT plays in the Centre operations. It is responsible this Unit to provide IT services and infrastructure to facilitate electronic handling of your data and activities in the Centre relating to admissions, registration, examinations and student identity cards.

5.5 Channels of Communication

Direct all enquiries to acetel@noun.edu.ng, +234-8182972097.

PART 6: STUDENTS' ISSUES AND POLICIES (<https://acetel.nou.edu.ng>)

6.1 Introduction

This section informs you of your rights and responsibilities as a student of ACETEL. Your obligation is to abide by the code of conduct of the University. It is the University's responsibility to provide high quality services and channels through which students' complaints can be addressed and resolved.

6.2 Code of Conduct

As a student, you are expected to observe all the rules and regulations of the University which include but not limited to the following:

- Students of the ACETEL are required to be self-disciplined and responsible, as they study at their own pace.
- Students are strongly advised to desist from cultism and other acts that may lead to indiscipline.
- Students are expected to conduct themselves in an orderly and peaceful manner.

6.3 Studying Tips

Studying at the ACETEL gives you the unique opportunity to study while you are engaged in work or other activities. It is therefore important for you to note that this new mode of learning requires a different approach to studying:

- Excellent time management skills will be needed to keep up with the pace of work.
- It is necessary to study consistently as it is easier to spread out work than to do so much within a short space of time especially if you are engaged in an employment.
- You need to develop a weekly study plan – timetable.
- Review your work at the end of each week and modify your plan accordingly.
- Attempt all activities recommended in your course materials.
- Use memory enhancing aids (e.g. mnemonics, visualisation, revision etc).
- For self-help study groups with other ACETEL students within your locality as this helps spur you on to achieving your goals as you will not want to let yourself down.

6.4 Students' complaints

The ACETEL has made provision to address any grievances or needs that students may have.

6.5 Sexual Harassments Policy (<https://acetel.nou.edu.ng>)

The Centre is at the fore front of promoting gender equality in the University community. It also encourages the formation of an enabling work and study environment for both staff and students. ACETEL, acknowledges that while sexual harassment is not limited to women, and therefore, as part of efforts to create this enabling environment, will continue to raise the level of moral standards among staff and students. The Centre is therefore dedicated to enlightening its public on the evils of sexual harassment and other associated anti - social conduct. Sexual harassment has very grave effects on the overall productivity of staff and students in the university. Consequently, it is a very serious infraction, requiring punitive actions.

Examples of conducts that may constitute sexual harassment, among others are:

- Sexual pranks, teasing, vulgar jokes
- Verbal abuse of a sexual nature
- Physical touching of a sexual nature
- Giving sexually suggestive gifts
- Making sexually suggestive gestures
- Posting sexually suggestive pictures
- Unwanted hugging
- Groping without permission.
- Forceful sexual intercourse (Rape)

Policy Statement 1

To enlighten all staff / learners about the impacts and ills associated with sexual harassment, and thereby create a sense of social responsibility.

Implementation Strategies

- i. Adopt and implement the university's Anti - Sexual Harassment policy.
- ii. Produce and disseminate a code of conduct leaflet and on the university's website issues on anti- sexual harassment at the start of every academic session.
- iii. Incorporation of the anti-sexual harassment policy into the staff conditions of service.

Policy Statement 2

The University ensures an environment, free of sexual harassment for all and achieve gender equity and equality.

Implementation Strategies

- i. Formulate procedures to be followed in cases of sexual harassment.
- ii. Institute structures like the Anti-Sexual Harassment Committee to ensure fair hearing for all parties.
- iii. Institutionalise support for victims of Sexual harassment by designated Counsellors.

Procedures to be followed by Complainants

- i. Filing complaints
- ii. Follow up with face-to face interaction with members of the Anti-Sexual Harassment Committee.
- iii. Complainants are encouraged to provide substantial or circumstantial evidence.

N.B

- The composition of the committee will have a representative for either staff or student depending on the complainant.
- Where the matter is reported to the Police or other Security Agencies directly, the Centre will not take any action, in order not to interfere with the police investigation and findings. On completion of the police investigations, the Centre can take appropriate actions according to its policies, code of conducts and bylaws.

Review Mechanisms

- i. When the complainant is a student, and is not satisfied with the outcome, he/she can appeal to University Senate.
- ii. Where the complainant is a staff, and is not satisfied with the decision, he/she can appeal to the University Council.

Advice to prevent Sexual Harassment

- i. Students/staff should be security conscious always, and must avoid situations that can compromise their safety, therefore students are advised to avoid lonely, remote places and paths.
 - ii) Counselling on Sexual harassment should be an integral part of the Orientation exercises.

Responsibilities of the university management

- i. The university shall implement the Anti- Sexual Harassment Policy.
- ii. There shall be prompt investigation of cases of sexual harassment.
- iii. The university's management should institute appropriate disciplinary action for offenders.

Policy Statement 3

- i. The university advises all staff and students to report incidences of sexual harassment and vices to the designated quarters for appropriate action., while the university ensures the privacy of all complainants**

The university recognizes that there are incidences of false accusations of sexual harassment, it shall take appropriate measures to punish accusers, if claims of sexual harassment is discovered to be false.

Implementation Strategies

The Anti-Sexual Harassment Committee will:

- i. Obtain the victim's consent to proceed and write a report to the Centre/ University management.
- ii. Start appropriate processes outlined in 8.1 above.
- iii. Make recommendations commensurate with offence, such as suspension, demotion, loss of remuneration, loss of promotion, dismissal, expulsion (students) and warning.

The university's management will:

- iv. Implement sanctions/ recommendations within the shortest time possible.
- v. Create an institutionalized procedure for workshop training on Anti-Sexual Harassment for counselors and other interested members of the Centre Community.
- vi. Ensure that the policy shall be extensively disseminated to every member of the University community through appropriate channels.
- vii. Be fully committed to the implementation of the policy.
- viii. Initiate an internal complaints procedure that ensures privacy of all parties involved.

Policy Statement 4

To regularly monitor and evaluate the policy process to determine the level of implementation and progress in attaining aims of policy

Implementation Strategies

The university's management will:

- i. Ensure that there is a mechanism in place for tracking cases of sexual harassments and their resolutions.
- ii. Compile reports annually on the implementation progress of this policy, for research purposes and evaluation.

Disciplinary Actions

The Centre shall create and implement a disciplinary action process to ensure equality and consistency across all cases of sexual harassment in the university as contained in the Staff Conditions of Service and student handbook.

6.6 RISK MITIGATION POLICY (<https://acetel.nou.edu.ng>)

Risk Mitigation is an enabling function that adds value to the activities of the organisation and increases the probability of success in achieving our strategic objectives. It's about managing uncertainty and creating an environment where surprises are minimised. This document defines the practices adopted by the Centre to identify risk, in order to reduce potential negative impacts, and improve the likelihood of beneficial outcomes. The benefits of creating a practical Risk Mitigation Framework that can be applied across all parts of the Centre include a consistent, structured approach to identifying and managing risk, supports the achievement of the University's strategic and operational goals by managing risks that may otherwise impede success and encourages an open and transparent culture where risk discussion and awareness are supported. Others are better decision making practices that support risk informed choices, prioritize actions and distinguish between alternative courses of action; encourages an understanding of the risk environment within which the University operates and provides assurance to the Vice Chancellor and Centre Director that critical risks are being identified and managed effectively.

The Mitigation of risk happens every day across all parts of the University, in many different ways. The following examples are put in place on how the University will mitigate risk of health and safety at work, code of conduct, research, physical security, internal audit, academic quality, business continuity and emergency management. The process used to

identify and manage risk at University aligns with the ISO 31000:2009 Risk Mitigation Standard.

An Effective Enterprise Risk Management System

For risk Mitigation to be effective, it is important that University staff and stakeholders have a shared understanding of what an effective system for risk Mitigation looks like, and how we will achieve this. The ISO 31000:2009 Standard recommends organisations adopt the following principles that risk mitigation adds value, is an integral part of organizational processes, part of decision making, explicitly addresses uncertainty and its practices are systematic, structured and timely. Also, the principle of available available information, alignment with university and internal risk management; dynamic iterative and responsive to change facilitates continual of the university at large and ACETEL in particular. The Risk Mitigation Office will periodically review and confirm that each principle continues to be satisfied and is tailored to meet the needs of the University.

Risk Mitigation is embedded within University and ACETEL systems and processes to ensure that it is part of everyday decision making. In particular risk mitigation must be embedded in the following key processes like annual planning and budgeting processes, project and programme management and development and review of University policies and procedures and procurement and asset management. The Centre is exposed to a diverse range of internal and external factors and influences that make it uncertain whether, when and the extent to which our objectives will be achieved. The objectives referred to are expressed in the Standard as ‘the overarching outcomes that the organisation is seeking. These are the highest expression of intent and purpose, and typically reflect its explicit and implicit goals, values and imperatives or relevant enabling legislation. The Centre articulates its strategic intent and purpose through its Implementation Plan. Risk treatment options should be based on cost benefit analysis of outcomes, i.e. does the cost of applying the required treatment or control outweigh the impact or the benefit? Treatments are essentially based on one (or a mixture) of the following options.

The assessment is used to determine the severity of the risk and identify those which are unacceptable to the University and require Management attention and further treatment. It also forms the basis of ongoing monitoring. The following table is to be used as a guide to determine whether a risk requires additional treatment. If the assessed risk rating is above the tolerable level for that impact area, then treatment is required that will either reduce the likelihood of the event occurring, or the impact should it be realised. If the risk rating is at or below the target level as indicated then the risk may be accepted. (Please note that project risk tolerance and acceptability should be specified as part of a risk and issues Mitigation plan for the project.) The Risk Mitigation Office will support risk owners in this process, and undertake an annual review of identified risks and controls, encompassing strategic, environmental, and annual planning changes.

The Centre treats and accepts risks by avoiding, mitigating, retaining, transferring and accepting the risk if the benefits outweighs the cost.

6.7 ENVIRONMENTAL AND SOCIAL SAFEGUARDS POLICY (<https://acetel.noun.edu.ng>)

Identification of specific hazard

1. Environmental pollution resulting from use of hazardous materials

Policy 1: Hazardous Materials

ACETEL develops

- 1.1 a hazardous materials inventory and update yearly.
- 1.2 work practices and procedures for handling hazardous materials for either routine maintenance or major renovation/demolition.
- 1.3 and implement any required training for the supervisors and/or workers involved with the handling of hazardous materials, as well as emergency response personnel.
- 1.4 a plan to move to "green" building materials and "sustainable sites" for routine maintenance and renovations.

Policy 2: Contamination resulting from improper waste disposal

ACETEL would:

- 2.1 Connect sewage component of waste to a central/ municipal sewage disposal system. In the event where the municipal treatment plant is not available, a sewage treatment plant would be integrated into the projects civil works.
- 2.2 Provide civil works with deliberate and appropriate technology plan for signage of collection points and storage points for waste, and tidiness of waste management areas.
- 2.3 Recycle, re-use and refurbish/repair the listed categories of solid wastes in the workshop/works department.
- 2.4 Train staff regularly on current practices of waste management.
- 2.5 E-mail staff (ACETEL) to inform them of achieved successes and challenges in waste management.

2. Insensitivity to human rights.

Policies 3: Human Rights and Physically Challenged Persons

Based on the identified disabilities in the work place/school, the following policies are formulated:

- 3.1 **Employability:** Physically challenged individuals in ACETEL would be given a fair share of total employment and student enrolment.
- 3.2 **Competitive, Integrated Employment:** Physically challenged individuals would benefit from having jobs in ACETEL alongside those without disabilities and are paid the same wages for same or similar work.
- 3.3 **Supportive Employment and Return-to-Work/Stay-at-Work:** ACETEL would provide a Social Security Disability Insurance or Supplemental Security Income for people who became permanently disabled while on the job.

3.4 Para-Transit Access: ACETEL would provide access to transit systems which allows people with disabilities to reliably get to work/learning environment and participate in a rich social life.

3.5 Communication and Assistive Technology in the Workplace: ACETEL would provide advanced information and communication technology which have helped in the development of working tools for people with various disabilities such as: computers with QWERTY keyboards and refreshable Braille displays, websites, online systems, digital screen magnification and software products such as JAWS (Job Access with Speech) for windows and NVDA (Non-Visual Desktop Access) for interaction.

In addition, there would be provision for on-site American Sign Language services or Video Remote Interpreting to assist with in-person communication in the workplace/learning environment, as well as providing employees/scholars with hearing disabilities access to Video Relay Services to aid in communication with outside parties.

3.6 Physical Barriers, Building Access, and Workplace/Learning Environment: ACETEL would ensure the accessibility of physical spaces and the availability of reasonable workplace/learning environment.

3.6.1 In cases of **Ambulatory disability**, ramps and elevators and special provisions in the design of their conveniences shall be considered in the architectural design of the structure.

3.6.2 ACETEL would ensure that office equipment that allows for height adjustable work surfaces to accommodate different wheelchair heights and limb mobility are purchased and installed.

3.7 Flexible Hours and Extended Medical Leave Policies: ACETEL would support physically

3.8 ACETEL would provide smoking zones for people with smoking habits, while smoke detectors should be installed in other no smoking zones including the toilets.

3.9 ACETEL would ensure there is no marginalisation or stigmatisation of HIV carrying persons.

4. Political and Religious Induced Insurgency

Policies 4: Political and Religious induced insurgency

ACETEL would ensure:

4.1 Religious needs like break periods within prayer times and holidays during festive periods are accommodated.

4.2 Incentives and welfare packages be given to workers during festivities.

4.3 That the organization dress code (if any) would not interfere with religious beliefs and requirement.

4.4 The hosting of religious based programs when the need arises for interested members.

4.5 Employees/Learners records are verified for past possible criminal activities prior to engaging their services or enrolment as the case may be.

4.6 Unauthorised gathering and unlawful groups within the university/centre be sanctioned.

5. Crisis and Emergency Management

6. Policy 5: Crisis and Emergency Management

ACETEL would ensure;

- 5.1 That there is a sick bay with a stand-by ambulance service and first aid kit for employees and learners. The University would consider retaining specific medical consultants which patients under crisis can be referred to.
- 5.2 That during construction a certified safety officer frequently briefs the site on safety tips and provides them with safety gears to be worn at all time within the construction site. Also, safety signs like; slippery floor, glass transparency, heavy machine area and caution lines in multi-storey structures should be displayed at all times.
- 5.3 Periodic Health and Safety Education to staff/student and also taking part in realistic practices.
- 5.4 Visible muster points, fire exits and fire alarms to alert occupants in case of fire. In addition, exit points in the building have to be clearly labelled, and so should assembly points. There should be legible notices on the walls that direct people what to do in case of an emergency
- 5.5 That there is provision of adequate fire fighting devices within the structure which are checked regularly for maintenance.
- 5.6 There are procedures in place for routine responsive cleaning and caution signs for wet areas.
- 5.7 That there is proper security detailing for staff/student on official field trips to sensitive areas.

6.0 Unfavourable work/learning environment

ACETEL would ensure:

- 6.1.1 That the structures are designed to accommodate more natural light with wide windows and open lobbies. The use of open courtyards and atrium courts where applicable to light up spaces in the structures should be adopted.
- 6.1.2 It adopts the use of burning fossil fuel (to power generators) as a back-up for power failure from the national grid. It should however be emphasised that zero emission is part of the projects objective to minimise contributions to green house effect. Solar and Wind Energy are strongly recommended as an alternate source of power supply.
- 6.2 Temperature: Provisions should be made to modify the external climatic conditions (hot or cold) in the working/learning environment. These modifications can be done artificially or naturally.

ACETEL would ensure:

- 6.2.1 That structures are designed with adequate ventilation (to specifically take care of stuffiness, dampness and suffocation) by introducing ventilation lobbies and all the spaces within the structure should be cross ventilated (minimum of two windows on either walls of the space).
- 6.2.2 That artificial interventions for ventilation and temperature modifications are included in their design by use of central air conditioning systems, split and window units. The service of a competent technician for these systems should be involved during periodic maintenance to avoid failure resulting from poor design and execution.
- 6.3 Pollution: this could be caused by emissions and poor oxygen diffusion within the structure. Emissions could arise from the proximity to waste dumping sites or failures from the conveniences.

ACETEL would ensure:

6.3.1 That these emissions are taken care of during the design stage of the structure by providing adequate vents and drains in the conveniences to take out stench and waste water that could cause discomfort in the environment. Proper waste management by provision of waste basket in the conveniences for solid wastes should be provided.

6.3.2 That oxygen diffusion would be controlled by introduction of potted plants and green areas within the structure at the conceptual design stage. Ventilation fans should be a component of the ventilation system in the design of the structure.

6.4 ACETEL would ensure that pest control is considered from the conceptual stage of the design by avoiding dead corners and dark neglected spaces in the structure. Organic pesticide treated nets should be used where necessary. There should be periodic fumigation of the structure to control sporadic, endemic and epidemic pest conditions.

6.5 ACETEL would ensure that constant and adequate water supply is provided for in the structure. A central hot and cold water supply through the structure with taps or drinking fountains points at the lobbies should be provided to service the users at all times. A water treatment plant should be captured in the design of the structure to control the quality of water supply to the building.

6.6 Human Factor:

ACETEL would ensure:

6.6.1 That a worker/learner is not assigned workload beyond his/her ability and professional capabilities to ensure efficient delivery of projects and assignments.

6.6.2 That a worker/learner is not oppressed and should get adequate support such as: sponsorship, resources and encouragement from the supervisors/superiors/management.

6.6.3 Positive cordial relationships is maintained amongst staff to guarantee a harmonious working environment. Staff should be made to understand their individual roles within the organisation.

6.6.4 Frequent board and welfare meetings is organised with staff/learners to provide a conducive working/learning environment.

6.6.5 A mixture of closed and open office design to accommodate sensitive tasks and interaction for easy flow of work.

6.7 Conveniences:

ACETEL would ensure:

6.7.1 That at the design stage of the structure, adequate conveniences with good proximity are provided for the staff/learners to ensure maximum comfort.

6.7.2 Offices and other spaces are equipped with comfortable furniture and working equipment that can be used to facilitate delivery of the assignment. In cases of multi-storey buildings, adequate and convenient circulation (lifts, staircases, walkways, and ramps) would be provided for the users

6.8 NOUN-ACETEL SCHOLARSHIP POLICY (<https://acetel.nou.edu.ng>)

AFRICA CENTRE OF EXCELLENCE ON TECHNOLOGY ENHANCED LEARNING (ACETEL) SCHOLARSHIP POLICY

ABOUT ACETEL

The Africa Centre of Excellence on Technology Enhanced Learning (ACETEL) is a World Bank, Association of African Universities, and Nigeria's National Universities Commission supported regional centre of excellence focusing on development of human capacity and research in digital solutions that will lead to the utilisation of technology for education. The Centre aims to bridge the technology knowledge gap and achieve high levels of digital development for the African continent. The Centre will assist countries in the West African sub region build capacity in ICTs and cyber security as well as mainstream digital policies and the affordances of digital technologies in education and all sectors of the economy.

ACETEL is domiciled at the headquarters of the National Open University of Nigeria, Jabi, Abuja. The Centre team comprise of scholars drawn from relevant fields of science as well as public and private sector stakeholders. Working in partnership with these stakeholders, the Centre, aims to develop courses and provide trainings in the development of ICT tools and solutions for deployment in the education space.

VISION OF THE CENTRE

To be recognised for excellence in research and development of ICT digital solutions and their secure deployment for learning with application to all sectors

MISSION OF THE CENTRE

Development of digital expertise to drive economic growth and transformation in the West African sub-region and beyond

NOUN-ACETEL SCHOLARSHIP POLICY

ABOUT THE AWARD: There are two categories of Award: The Centre awards Scholarships to Postgraduate candidates to enable them undertake higher degree studies in ACETEL at Masters and Doctorate levels and for short professional training in ICT.

ACETEL awards scholarships on the affordances of technology to ensure digital literacy and enhance the quality of Science, Technology, Engineering and Mathematics (STEM) education, and also provides access to postgraduate education, training and professional development opportunities for suitably qualified Africans. ACETEL scholarship alumni are expected to contribute actively to development in their Countries.

Being an open and distance learning institution, provisions will be made for laptops, data and access to virtual laboratories and libraries. Research and learning visits will be facilitated where

necessary. Studies will be flexible to suit the need of learners particularly females. Provision for examination on demand will be available and examinations can be conducted at the comfort of student's homes.

TO BE TAKEN AT: Africa Centre of Excellence on Technology Enhanced Learning (ACETEL), National Open University of Nigeria.

PRIORITY FIELDS:

- 1) **Artificial Intelligence**
- 2) **Cyber Security**
- 3) **Management Information System**
- 4) **Short Courses**

- | | |
|---------------------------|---|
| ✓ Internet of Things | ✓ English language for non-English Speakers |
| ✓ Cloud Computing | ✓ Digital Literacy |
| ✓ Block Chain | ✓ Cyber Security |
| ✓ Open Government Data | ✓ Entrepreneurship |
| ✓ Data Base Management | ✓ Leadership and Project Management |
| ✓ Data Analysis | ✓ Learning Technology |
| ✓ Artificial Intelligence | ✓ Programming: C, Python, Java.... |

TYPE: Doctorate, Masters Degrees and Short Courses

ELIGIBILITY: To be considered for a postgraduate scholarship or short course award, applicants must meet the following requirements:

- Citizen of African country.
- Minimum academic requirement: Bachelor's or Master's degree or equivalent for Masters and Doctorate Degrees, or a minimum of 5 credits at O'levels for short courses
- Demonstrate a clear vision of how the knowledge and training gained through the scholarship will be used to improve reform in their home countries
- Satisfactory English or French proficiency to enable full participation in a training course delivered in English or French
- Satisfy all requirements of the Nigerian Government for the appropriate student visa.

TARGET GROUP

- Nationals of African Countries especially countries within the West African sub-region (:Benin, Burkina Faso, Cape Verde, Côte D'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Saint Helena, Senegal, Sierra Leone, Togo) are encouraged to apply. **Females of such countries are particularly encouraged to take advantage of this opportunity and will be given priority**
- Professionals working in the Public Sector, the Private Sector or a Non-Governmental Organisation (Civil Society).
- Qualified candidate who wishes to undertake a Masters degree or Doctorate degree in one of the listed priority fields of study.
- To have a clear vision on how you will use the knowledge and training gained through the programme to improve reform in the proposed field of study.
- Gender Equality: ACETEL targets equal participation of females and males. Applications from female candidates are strongly encouraged, and mechanisms are in place to support female applicants and awardees.
- Disability Inclusion: ACETEL aims to ensure that people with disabilities are given fair and equal opportunity to apply and obtain a scholarship.
- Inmates: Qualified inmates.

- Special consideration will be given to Regional candidates (West African Sub-Region)

SCHOLARSHIP ADVERTISEMENT

The scholarships will be openly advertised on the Centre's, University's, National Universities Commission (NUC) and Association of African Universities (AAU) websites as well as on relevant Organization/Associations/Intuitions platforms. Other social media platforms of the Centre (twitter, facebook, linkedin and whatsapp) will also be utilized. Interested candidates will apply online on the ACETEL website: acetel.nou.edu.ng . Application forms and other relevant documents will be completed and submitted online only.

APPLICATION PROCESS

The application window will be thirty days (one month). Applications will be acknowledged once submitted. Responses to applications will be sent to candidates via email within one month of the closing date of the advertisement.

SELECTION PROCESS: CRITERIA AND REQUIREMENTS

ACETEL scholarships are highly competitive and only applicants who are outstanding across board will be selected. A selection committee will be constituted to assess applications in a fair, transparent and accountable manner using the following criteria;

- Academic merit as evidenced by quality of degrees, full academic transcripts, and relevant publications to be referenced by applicants

- The viability of the study/research plan (*PhD Applicants only*).
- Applicants are required to make a case for their scholarship by submitting a statement of purpose (maximum 500 words) stating the reason(s) they want to undertake the study, and its expected impact on national development (*MSc Applicants only*).

REQUIREMENTS

Short Courses

Possession of five (5) O/level credits or its equivalent, including English or French Language.

MSc

1. A minimum of Second Class Upper (2.1) qualification in the first degree or its equivalent
2. Possession of five (5) O/level credits or its equivalent, including English or French language.

PhD

1. A minimum of Second Class Upper (2.1) or its equivalent in their first degree and CGPA of 4.5 at MSc.
2. Must submit a research proposal (of not more than five (5) pages) to include: Topic, introduction, objective, methodology and mode of data collection
3. Possession of five (5) O/level credits or its equivalent, including English or French language.

REQUIRED DOCUMENTS

Applicants are advised to scan copies of all relevant academic documents and attach to their online application form.

NUMBER OF SCHOLARSHIPS: Ten (10) for Masters students, Five (5) for Doctorate Degree students and Forty (40) for Short courses annually

VALUE OF SCHOLARSHIPS: The scholarship budget is valued at \$3000 for Masters students, \$4000 for Doctorate Degree students and \$100 for Short Courses

DURATION OF SCHOLARSHIPS: For Masters programmes the scholarship will be for three (3) semesters while scholarship for Doctorate programme will be for six (6) semesters.

Scholarship for short courses will vary with the duration of the course. No scholarship would be allowed beyond the duration of the course and all scholarships will be provided annually.

TERMS AND CONDITIONS OF SCHOLARSHIP

Student on scholarship must maintain a CGPA of 4.5 and above. Funds available under the scholarship must be utilized strictly for the purpose indicated (Registration, examination, research, publication, data, laptop etc). Candidates on scholarship must conclude their studies within the minimum period allocated to the programme

COMMENCEMENT: 2020

HOW TO APPLY FOR ACETEL SCHOLARSHIP AWARD

- Application Form must be requested online: Go to ACETEL Website www.acetel.nou.edu.ng
- Select Scholarship and Click on Apply Now
- Choose a course (Masters, Doctorate Degree or Short courses)
- Carefully read the eligibility criteria to check that you are eligible to apply
- Request for the application form
- Fill in the details, upload relevant document and submit request
- Acknowledgement will be sent Via Email address

