DEPARTMENT OF COMPUTER SCIENCES

POSTGRADUATE PROGRAMMES

LAGOS STATE UNIVERSITY

INTRODUCTION

The postgraduate programmes in the department of computer sciences are governed by the general regulations of the postgraduate school of Lagos State University.

RATIONALE AND PHILOSOPHY

Since the invention of computer, this generation has witnessed an exponential growth in all facets of life, ranging from teaching and research, transportation, communication, marketing, to automobiles, manufacturing, patient diagnosis; surgery; treatment and management, the list continues. All these have been focused towards making our daily activities easier, better living and helping businesses to grow in order to increase productivity. A major instrument to the success of this digital technological advancement is the state-of-art-research in computer sciences. In the department of computer science, Lagos State University, we believe that computer sciences research has produced lots of good results, but that there are still lots to do. In view of this, the focus of our postgraduate programmes is to train our students on how to conduct a productive state-of-art research in computer sciences, which will be relevant to the growing needs of this generation. The philosophy of our postgraduate programmes is anchored on the unbiased and systematic observations, accurate documentation and interpretation of facts with a view to generating a body of knowledge.

AIMS

In line with the rationale and philosophy stated above, the aims of the postgraduate programmes include:

1. to produce graduates with sense of inquiry, capacity for independent research and motivation to extend the frontiers of science and technology.
2. to produce graduates with transferrable skills and knowledge relevant to both academics and industries, which will allow them to be comparable with peers in the international community.
3. to produce graduates who will be adequately equipped for relevance in the global knowledge economy.
4. to produce graduates who are capable of applying appropriate scientific principles for solving problems for the promotion of human well being.

OBJECTIVES

The following are the objectives of the programmes:

1. to teach computer science courses that are relevant to the growing needs of this dynamic world.
2. to expose our students to the multi-disciplinary nature of computer sciences research
3. to inculcate in our students presentation skills and increase their awareness on the benefits of public engagements.

LEARNING OUTCOMES

At the end of any of the postgraduate programmes in computer sciences, graduates are expected to:

1. have comprehensive knowledge of computer sciences encompassing an understanding of the theoretical foundations and quantitative tools in computer sciences, as well as the ability to apply the knowledge to solving problems.
2. be able to demonstrate problem solving capacity using multidisciplinary approaches in an innovative and creative way.
3. display comprehensive knowledge of computer sciences and should have acquired entrepreneurial skills for self sufficiency and also to meet the needs of the public and private sectors in Nigeria and beyond.

REGISTRATION OF COURSES

Students are required to complete registration of courses based on the time and conditions stipulated by the postgraduate school of the Lagos state university.

CONTINUOUS ASSESSMENT, EXAMINATIONS AND GRADING SYSTEM

a. Continuous Assessment

Continuous Assessment (CA) shall be done through essays, tests, term papers, tutorial exercises, quizzes and home work. Scores from CA shall be 30% of the final marks.

b. Examination

Final examination shall be conducted on every course at the end of each semester. Scores from the final examination shall be 70% of the final marks.

c. Grading System

Grading of courses shall be done by a combination of percentage marks and letter grades translated into a graduated system of Grade Point Equivalents (GPE). For the purpose of determining a student's standing at the end of every semester, the Grade Point Average (GPA) system shall be used. The GPA is computed by dividing the total number of credit points (TCP) by the total number of units (TNU) for all the courses taken in the semester. The credit point for a course is computed by multiplying the number of units for the course by the Grade Point Equivalent of the marks scored in the course. Each course shall be graded out of a maximum of 100 marks and assigned appropriate Grade Point Equivalent as in Table 1.

Table 1: Translation of percentage marks and letter grades to grade point equivalents

Credit Units (CU)	% Scores	Letter Grades	Grade Points (GP)	Grade Points Average (GPA)
Vary according to contact hours assigned to each course per week per semester, and according to load carried by students. The sum of all credit units makes the Total Credit Units (TCU)	70 – 100	A	5	Computed by multiplying columns 1 and 4, and dividing by the Total Credit Units GPA = (CU x GP)/TCU
	60 – 69	B	4	
	50 – 59	C	3	
	0 – 49	F	0	

POSTGRADUATE PROGRAMMES

The Computer Sciences department offers three postgraduate programmes:

1. Postgraduate diploma (PGD) programme, leading to the award of PGD in computer sciences.
2. Masters of Science (MSc) programme, leading to the award of MSc degree in computer sciences.
3. Doctorate degree programme, leading to the award of Doctor of Philosophy (PhD) in computer sciences.

1. POSTGRADUARE DIPLOMA (PGD) IN COMPUTER SCIENCES

Duration of Programme

The PGD programme in computer sciences is a full time programme and runs for a minimum of 2 semesters and maximum of 4 semesters.

The Admission requirements

The criteria for admission into the PGD in Computer Sciences programme will be as follows, provided that the candidate has five credit passes including English, Mathematics, Physics and any two science related subjects:

a. Candidates with Bachelor degree or its equivalent in computer sciences, computer education, mathematics, statistics, physics or Engineering from a recognised university with a minimum of a third class division.
b. Candidates with Bachelor degree or its equivalent in Chemistry, Biology, Economics, Business Administration or any other science related course from a recognised university with a minimum of second class lower division.
c. Candidates with Higher National Diploma (HND) or its equivalent in computer sciences, mathematics, statistics, physics or Engineering from a recognised institution with a minimum of lower credits.
d. Candidates with HND or its equivalent in Chemistry, Biology, Economics, Business Administration or any other science related course from a recognised institution with a minimum of upper credits.

Qualifying Examination

All candidates seeking admission to the PGD computer science programme are required to obtain an admission form from the postgraduate school and may be subjected to a qualifying examination / interview or both. Candidate's performance in the qualifying examination will be used by the department to select students who will be recommended to the postgraduate school for provisional admission into the program.

Programme Requirements

a. Pass Mark

The minimum pass mark in any course shall be 50%

b. Good Standing

To be in good standing, a student must in each semester have a Cumulative Grade Point Average (CGPA) of not less than 3.00.

c. Withdrawal

A student whose CGPA is below 3.00 at the end of two consecutive semesters shall be withdrawn from the programme.

Requirements for Graduation

To qualify for the award of the PGD in computer science, candidates must:

1. Pass a minimum of 30 credit units, made up of
    a. 16 credit units in compulsory courses
    b. 10 credit units in elective courses
    c. 4 compulsory credit units of Research Project.
2. Satisfy all other requirements stipulated by the postgraduate school of the Lagos state university.

Table 2: Course Outline for PGD in Computer Science – Semester 1

Code	Course	Credits	Status
CSC 701	Programming Techniques	2	C
CSC 703	Discrete Mathematics	2	E
CSC 705	Computer Architecture and organization	2	C
CSC 707	Database management	2	C
CSC 709	Operating Systems	2	C
CSC 711	Introduction to Information Processing Methods	2	E
CSC 715	Fundamentals of Data Structures	2	C
CSC 717	Systems Analysis and Design	2	C
CSC 719	Fundamental of digital electronics and Logic Design	2	E
CSC 721	Embedded Computer System	2	E
CSC 731	Robotics Programming	2	E
CSC 735	Formal language and Automata	2	E

NOTE: C represents compulsory courses and E represents Elective courses. Students must take all compulsory courses and must choose minimum of 4 units (but not more than 6 units) from the elective courses. All students are required to register for minimum of 14 units in the first semester.

Table 3: Course Outline for PGD in Computer Science – Semester 2

Code	Course	Credits	Status
CSC 702	Object Oriented Programming	2	C
CSC 716	Foundation of Sequential Program	2	E
CSC 722	Introduction to Algorithm Design	2	E
CSC 724	Web Design and Data Security	2	C
CSC 730	Introduction to Artificial intelligence	2	E
CSC 732	Software Engineering	2	E
CSC 734	Compiler Construction	2	E
CSC 736	Analysis and Design of Digital System	2	E
CSC 740	Quantitative Methods	2	E
CSC 799	Project	4	C

NOTE: C represents compulsory courses and E represents Elective courses. Students must take all compulsory courses and must choose minimum of 6 units (but not more than 8 units) from the elective courses. All students are required to register for minimum of 16 units in the second semester.

COURSE DESCRIPTIONS FOR THE PGD PROGRAMME

CSC 701 PROGRAMMING TECHNIQUES: (2 Units) - C

Evolutionary trends of computer programming – Overview of different programming paradigms to include Structured programming, Event driven programming, multimedia (images, animation and audio) programming and Concurrent programming. Programming tools: Flowcharts, decision Table, Data Flow and Unified Modelling Language. Basic concept of Object Oriented Programming (OOP). Methodology of programming computers in OOP language environment using Java and Visual Basic.

CSC 702 OBJECT-ORIENTED PROGRAMMING: (2 Units) - C

Basic OOP Concepts: Classes, Objects, inheritance, polymorphism, Data Abstraction, Tools for developing, Compiling, interpreting and debugging, Java Programs, Java Syntax and data objects, operators. Central flow constructs, objects and classes programming, Arrays, methods. Exceptions, Applets and the Abstract, OLE, Persistence, Window Toolkit, Laboratory exercises in an OOP Language. Java or C++.

CSC 703: DISCRETE MATHEMATICS (2 Units) - E

Basic Set Theory: Basic definitions, Relations, Equivalence Relations Partition, Ordered Sets. Boolean Algebra & Lattices, Logic, Graph theory: Directed and Undirected graphs, Graph Isomorphism, Basic Graph Theorems, Matrices; Integer and Real matrices, Boolean Matrices, Matrices mod m, Path matrices. Adjacency Vectors/Matrices: Path adjacency matrix, Numerical & Boolean Adjacency matrices. Applications to counting, Algebraic Structures: General definition of algebra. Specific types of algebraic structure: Monoids, Groups, rings, field, isomorphism, quotient algebra; decomposition (sum and products) for algebra; polynomials and their roots;: elementary number theory.

CSC 705: COMPUTER ARCHITECTURE AND ORGANIZATION: (2 Units) - C

Fundamental building blocks, logic expressive immunization, sum of product forms. Register transfer notation, Physical considerations. Data representation, and number bases, Fixed and Floating point systems, representation memory systems organization and architecture. Memory system, general characteristics of memory operation. (Technology-magnetic recording semi-conductor memory, coupled devices, magnetic bubble). Memory addressing, memory hierarchy, virtual memory control systems. Hardware control, micro programmed control, Asynchronous control, I/C control. Introduction to the methodology of faulty tolerant computing.

CSC 707: DATABASE MANAGEMENT: (2 Units) - C

Information storage & retrieval, Information management applications, Information capture and representation, analysis & indexing, search, retrieval, information privacy; integrity, security; scalability, efficiency and effectiveness. Introduction to database systems: Components of database systems DBMS functions, Database architecture and data independence use of database query language. Relational Databases: Mapping conceptual schema to relational Schema; Database Query Languages (SQL) Concept of Functional dependencies & Multi Valued dependencies. Transaction processing; Distributed databases.

Information in the organization, DBMS Technology and concepts, entity relational analysis, the relational data model, structured Query language (SQL), Functional dependency diagrams, Normalization of data, client server database technologies, Data Integrity. What is Data Modeling: Conceptual & physical models, instances, attributes and identifiers, Entity relationship modeling and ERDs, Entity Relationship Diagramming, Supertypes, Subtypes, and Business Rules, System development life cycle, Project overview and getting started, Presentation project management, Final presentation components , Presentation . Relational Databases: Mapping conceptual schema to relational Schema; Database Query Languages (SQL) Concept of Functional dependencies & Multi Valued dependencies. Transaction processing; Distributed databases.

CSC 709 OPERATING SYSTEMS: (2 Units) - C

Overview of O/S: Role & Purpose, Functionality Mechanisms to Support Client- server models, hand-held devices, Design Issues influences of Security, networking, multimedia, Windows. O/S Principles: Structuring methods Abstraction, processes and of recourses, Concept of APIS Device organization interrupts. Concurrency: States & State diagrams Structures, Dispatching and Context Switching; interrupts; Concurrent execution; Mutual exclusion problem and some solutions Deadlock; Models and mechanisms (Semaphones, monitors etc.) Producer – Consumer Problems & Synchronization. Multiprocessor issues. Scheduling & Despatching Memory Management: Overlays, Swapping and Partitions, Paging & Segmentations Placement & replacement policies, working sets and Trashing, Caching.

CSC 711 INTRODUCTION TO INFORMATION PROCESSING METHODS: (2 UNITS) - E

Computers Today: A Brief Taxonomy, Data Representation, Processors, Memory, Input Devices, Output Devices, Storage, Operating Systems, Networking, Communications Technologies, Audio/Visual Technologies, The Internet and the World Wide Web, Information Technology and Ethics, Application Software, MS Excel, MS Word, MS Access, HTML, JavaScript.

CSC 715: FUNDAMENTALS OF DATA STRUCTURES: (2 Units) - C

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

CSC 716: FOUNDATION OF SEQUENTIAL PROGRAM: (2 Units) - E

The relationships between H/L languages and the Computer Architecture that underlies their implementation: basic machine architecture, assembles specification and translation of P/L Block Structured Languages, parameter passing mechanisms.

CSC 717: SYSTEMS ANALYSIS AND DESIGN: (2 Units) - C

System Concept; System Development Life Cycle Analysis: Fact gathering Techniques, data flow diagrams, Process description data modelling. System Design: Structure Charts, form designs, security, automated Tools for design.

CSC 719: FUNDAMENTAL OF DIGITAL ELECTRONICS AND LOGIC DESIGN: (2 UNITS) - E

Voltage and current sources. kirchoff's laws, linearity and super-position. Therein Norton theorems, steady, state response to sinusoidal excitation; impulse response, semi-conductors, bipolar and field effect transistors; Logic circuit design (gates, multivibrators, etc.) using semi-conductors materials, integrated circuits, classification of IC circuits.The Laboratory experiments should cover the following topics: IC families, TTL electrical characteristics, DeMorgan's theorem, Logic circuit simplification, Design of combinational circuit, Introduction to flip-flops, Application of flip-flops, Memory systems and Programmable logic

CSC 721: EMBEDDED COMPUTER SYSTEMS (2 UNITS) -E

Introduction to embedded Computing; embedded computing hardware: Processors, DSPs, SOCs, Peripherals; Communications; Software: Real-Time O/Ss, Scheduling; Design Methodology; Hardware Programming; FP GA Programming. Embedded computer systems are found everywhere -- cellular phones, cars, VCRs, cameras, and all kinds of consumer electronics. The huge numbers and new added complexity requires new technologies and design approaches. The goal of this course is to develop a comprehensive understanding of the technologies behind the embedded systems. The students develop an appreciation of the underlying technology capabilities and limitations of the hardware, software components for building embedded systems. The students also learn new approaches for building embedded systems and will gain experience on actual system design through several hands-on experiments.

CSC 722 INTRODUCTION TO ALGORITHMS DESIGN: (2 Units) - E

Basic algorithmic analysis: Asymptotic analysis of Upper and average complexity bounds; standard Complexity Classes Time and space tradeoffs in algorithms analysis recursive algorithms. Algorithmic Strategies: Fundamental computing algorithms: Numerical algorithms, sequential and binary search algorithms; sorting algorithms, Binary Search tress, Hash tables, graphs & its representation.

The study of algorithm design with emphasis on efficient algorithms and effective algorithms designs techniques program design, string processing; recursion, NP completeness and approximating algorithms for NP – Complete Problems. Algorithmic Strategies: Fundamental

computing algorithms: Numerical algorithms, sequential and binary search algorithms; sorting algorithms, Binary Search tress, Hash tables, graphs & its representation.

CSC 724 WEB DESIGN AND DATA SECURITY: (2 Units) - C

Distributed Computing, Mobile & Wireless computing, Network Security; Client/Server Computing (using the web), Building Web Applications.

CSC 730 INTRODUCTION TO ARTIFICIAL INTELLIGENCE: (2 Units) - E

Introduction to artificial intelligence, understanding natural languages, knowledge representation, expert systems, pattern recognition, the language LISP.

CSC 731 ROBOTICS PROGRAMMING: (2 Units) - E

Mathematical modeling of robot mechanisms and the analysis methods used to design control laws for these mechanisms. Homogeneous transformations and relative coordinate frames. Topics include: kinematics of robot manipulators, Robot velocities and static forces, manipulator dynamics, reference trajectory generation, control theory applied to robot manipulators, and tele-operation control. Introduction to NXT hardware and leJOS Java software. Software Engineering for Robot Programming. Handling of sensors and motor control. Event handling and polling. NXT sensors, Colour-based vision and the NXTCam. Sensor-based control Feedback control The Subsumption Architecture. More advanced knowledge Java collections: ArrayList, Stack and Queue Sorting Generic programming. Search-based control Uniformed search Informed search Adversarial search Navigation Mapping and localization Probabilistic road maps.

CSC 732: SOFTWARE ENGINEERING: (2 Units) - E

Software Design: Software architecture, Design Patterns, O. O. analysis & Design, Design for re-use. Using APIS: API programming Class browsers and related tools, Component based computing. Software tools and Environment: Requirements analysis and design modelling Tools, Testing tools, Tool integration mech.

Introduction, Software process, Project planning, Requirement Engineering, System Models: Process Models; DFDS, State-transition, State charts UML, Data Models, ER Models, Object oriented modeling using UML, Software verification and validation, Software Testing. Topics from process improvement; Software re-engineering configuration management; formal specification, software cost- estimation, software Architecture, software patterns, software reuse and open source development.

CSC 734 COMPILER CONSTRUCTION: (2 Units) - E

Review of compilers assemblers and interpreters, structure and functional aspects of a typical compiler, syntax semantics and pragmatics, functional relationship between lexical analysis, expression analysis and code generation. Internal form of course programme. Use of a standard compiler. Grammars and languages, recognizers, Top-down and bottom-up language Run-time storage Organization, The use of display in run-time storage Organization. The use of display in run time storage allocation. LR grammars and analysers. Construction of LR table. Organisation of symbol tablets. Allocation of storage to run-time variables. Code generation. Optimisation/Translator with systems.

CSC 735: FORMAL LANGUAGE AND AUTOMATA: (2 Units) - E

Formal Language: formal grammars, parsing, regular languages, context-free languages, automata theory. Finite state automata push-down automata.

CSC 736: ANALYSIS AND DESIGN OF DIGITAL SYSTEM (2 UNITS) -E

Information; representation and manipulation, coding logic functions, Boolean algebra, logic gates combination circuits design, logarithmic methods of synthesis and minimization of combination circuits design, logarithmic methods of synthesis and minimization of combination circuits memories including latch, flip-flop, shift heartier, RAM and ROM synthesis of synchronous sequential networks. Asynchronous sequential logic.

CSC 740 QUANTITATIVE METHODS: (2 Units) - E

Introduction to pure and applied mathematics. Introduction to numerical analysis and computation. Elementary differential equations, Introduction to mathematical statistics. Statistical methods, Data survey, collection, verification, validation and statistical analysis using statistical packages such as SPSS, SAS or R.

CSC 799: PROJECT: (6 Units) - C

Students are to choose project topics in computer science and carry out an independent research under the supervision of an academic staff. Students are required to submit a dissertation at the end of the project. **MASTERS OF SCIENCE (MSc.) DEGREE IN COMPUTER SCIENCE**

Duration of Programme

The MSc programme in computer science is a full time programme and runs for a minimum of 3 semesters and maximum of 5 semesters.

The Admission requirements

The criteria for admission into the MSc in Computer Sciences programme will be as follows, provided that the candidate has five credit passes including two science related subjects:

a. Candidates with Bachelor degree in computer science of the Lagos state university or its equivalent from a recognised university with a minimum of second class lower division.
b. Candidates with postgraduate diploma in computer science of the Lagos state university or its equivalent from a recognised university with a minimum CGPA of 3.0.

Qualifying Examination

All candidates seeking admission to our MSc computer sciences programme are required to obtain an admission form from the postgraduate school and may be subjected to a qualifying examination / interview or both. Candidate's performance in the qualifying examination will be used by the department to select students who will be recommended to the postgraduate school for provisional admission into the program.

Programme Requirements

a. Good Standing
To be in good standing, a student must in each semester have a Cumulative Grade Point Average (CGPA) of not less than 3.00.

b. Withdrawal
A student whose CGPA is below 3.00 at the end of two consecutive semesters shall be withdrawn from the programme.

c. Pass Mark
The minimum pass mark in any course shall be 50%

Requirements for Graduation

To qualify for the award of MSc degree in computer science, candidates must:

1. Pass a minimum of 30 credit units, made up of
   a. 24 credit units core courses
   b. 6 credit units for MSc thesis examination.
   c. Students are allowed maximum of 6 credit units of elective courses
2. Students are required to present one seminar.
3. Satisfy all other requirements stipulated by the postgraduate school of the Lagos state university.

Table 5: Course Outline for MSc in Computer Sciences – Semester 1

Code	Course	Credits	Status
CSC 801	Advanced Operating Systems	3	C
CSC 803	Advanced Computer Algorithms	3	C
CSC 805	Computer Communications and Networks	3	C
CSC 809	Database Systems	3	E
CSC 815	Operation Research	3	E
CSC 825	Programming Languages	3	C
CSC 871	Research Methodology	2	C

NOTE: C represents compulsory courses and E represents Elective courses. Students must take all compulsory courses and are allowed to choose maximum of 3 units from any of the elective courses. All students are required to register for minimum of 11 units in the first semester.

Table 6: Course Outline for MSc in Computer Sciences – Semester 2

Code	Course	Credits	Status
CSC 804	Advanced Software Engineering	3	C
CSC 808	Advanced Computer Architecture	3	C
CSC 812	Mobile and Adaptive Systems	3	E
CSC 816	Human Computer Interaction	3	E
CSC 818	Advanced Statistics	3	E
CSC 822	Designing Complex Software Systems	3	E
CSC 826	Artificial Intelligence	3	E
CSC 828	Digital Picture Processing	3	E
CSC 832	Microprocessor Systems	3	E
CSC 844	Seminar	2	C
CSC 872	Management And Entrepreneurship	2	C
CSC 899	Research Project	6	C

NOTE: C represents compulsory courses and E represents Elective courses. Students must take all compulsory courses and are allowed to choose maximum of 3 units from any of the elective courses. All students are required to register for minimum of 19 units (including the research project) in the second semester.

COURSE DESCRIPTIONS FOR THE MSc PROGRAMME

CSC 844 SEMINAR: (2 Units) - C CSC 801 ADVANCED OPERATING SYSTEMS (3 Units) - C

Structural design of an operating system: process model, inter-process communication, synchronization mechanisms, resource management, and scheduling. Protection issues. Implementation issues of

modern operating systems. Distributed operating systems. Deadlock detection, recovery, and avoidance. Case studies and Project (s)

CSC 803 ADVANCED COMPUTER ALGORITHMS (3 Units) - C

Review of data structures; linear data structures, hashing, trees, graphs, recursion. Complexity classes; empirical measurements of performance; time and space tradeoffs analysis. Algorithmic strategies: Brute-force algorithms; greedy algorithms; divide-and-conquer; backtracking; branch-and-bound; minimum spanning tree, heuristics, pattern matching and string/text algorithms; numerical approximation algorithms. Tractable and intractable problems.

CSC 804 ADVANCED SOFTWARE ENGINEERING (3 Units) - C

Software Engineering and its place as an engineering discipline. Life cycle of software system: Requirements analysis, development, operation and maintenance, Software metrics: Portability, Re-usability, Correctness, Reliability, Efficiency, Usability, Integrity, Maintainability and Flexibility. Software quality and testing. Software architecture: architecture description languages, pattern-oriented software architecture, component-based development, distributed software architecture using middleware, enterprise application integration, architecture for mobile and pervasive systems and model driven architecture. Advanced modeling: UML extension mechanisms, object constraint language and model checking. Software project management: Study of interpersonal process decision making styles, problem solving concepts and procedures, creative effort, conflict resolution, leadership and assessment. Concepts of motivation, team work and group dynamics. Software engineering and law: intellectual property law, professional ethics and code of conduct. Patents, trademarks, copyright, trade secrets, privacy and confidentiality, contracts and licensing, government regulations, global legal issues including internet law and cyber crime. Overview of open source software.

CSC 805 COMPUTER COMMUNICATION AND NETWORKS: (3 Units) - C

Channels and channel capacity; introduction to information theory; sharing network resources: telecommunication history; circuit switching and packet switching; multiplexing; FDM, TDM, statistical multiplexing; virtual circuits and datagrams; advantages and disadvantages; sharing the medium: Aloha, CSMA (persistent and non-persistent), CSMA-CD, token passing, CDMA, wireless LANs and simple performance analysis; dealing with errors; errors, coding and redundancy; hamming theory of codes; CRCs, ARQ protocols; CR selective retransmission and flow control; internet: ISPs, datagram forwarding; the DNS; IPv4; addressing and forwarding; encapsulation and address resolution; TCP and UDP; ports and congestion controls; example applications; modeling data networks: services and protocols; layered architectures, the OSI 7-layer model; introduction to queue theory; physical media; LANs and bridging; WANs and point-to-point links; routing; addressing and routing in the internet; end-to-end communication in the internet; and application protocols. Cyber space technology: Cyber Crime, Cyber Security and models of Cyber Solution.

CSC 808: ADVANCED COMPUTER ARCHITECTURE: (3 Units) - C

Advanced computer architecture including discussion of instruction set design (RISC and CISC), virtual memory system design, memory hierarchies, cache memories, pipelining, vector processing, I/O subsystems, co-processors, and multiprocessor architectures. Case studies of current systems. Prerequisite: Undergraduate Computer Architecture.

CSC 809 DATABASE SYSTEMS: (3 Units) – E

A brief introduction to database concepts: file systems and databases, and the relational database model; design concepts and implementation: entity relationship (E-R) modeling; normalization of database tables and structured query language; database design and implementation. Transaction management and concurrency control and distributed database management systems; database privacy, security, failure and recovery. Object oriented databases; client / server systems; data warehouse; data mining; databases in electronic commerce; web database development and database administration.

CSC 815 OPERATION RESEARCH: (3 Units) - E

Revised simplex method, matrix method of solution, integer programming problems, non-linear programming problems, selected case studies and computer implementations, sensitivity analysis for linear programming problems

CSC 812 MOBILE AND ADAPTIVE SYSTEMS (3 Units) - E

Introduction and overview; properties of wireless; PANs, LANs and WANs: Ad-hoc and infrastructure networks; physical constraints and limitations (transmission and reception), network structures and architectures, including hand-off and mobility support at the physical/link level; example of technologies at physical /link layers: PANS Bluetooth, LANS IEEE 802.11, HiperLAN, basic GSM and GPRS network structures and protocol architectures, next generation wireless overview including UMTS, IMT-2000 and W-CDMA; mobile IP: mobile IPv4 and mobile IPv6, problems with routing, quality of service and security; overview of use of intelligence in mobile systems and power management issues; file systems: CODA and the like and mobile infrastructure support. Adaptive and re-configurable systems, mobile multimedia and its relationship to proxying, context sensitive applications, ubiquitous computing, pervasive computing and ambient networking, overlays networks and vertical hand-offs, programmable networking and applications for mobile systems, code mobility and control signaling.

CSC 816 HUMAN COMPUTER INTERACTION: (3 Units) - E

Positive and negative effects of the computers and ICT on human beings and the societies. Computing as a profession, organizations using computers, sociology impacts of computers, egonometrics, individuals and computers, computer as an audit tool, computers in banking, computer based information systems and telecommunications, computers in consultancy services, design and construction, education, government, insurance, stock-brokerage, legal and medical professions.

CSC 818 ADVANCED STATISTICS: (3 Units) - E

Linear regression and correlation analysis, Curve Fitting. Multiple regression, forecasting, sampling theory. Test of Hypothesis (the null and the alternative hypothesis, F-test, t-test, chi square test, analysis of variance – one-factor experiment, two-factor experiment); Random numbers (distribution – probability distribution, binomial distribution, normal distribution, bivariate normal distribution, Beta distribution); Non parametric tests (sign test, mann-Whitney U test, Kruskal-Wallis H Test, H test corrected for ties); Use of SPSS

CSC 822 DESIGNING COMPLEX SOFTWARE SYSTEMS (3 Units) - E

Designing new computational systems and the software that drives them is both hard and interesting. One important style of computer science research, often called experimental systems research, revolves around such design activities. Research in this style seeks to advance our understanding of, and our ability to create, general computer systems that support the development and use of more domain-specific applications.

CSC 825 PROGRAMMING LANGUAGES: (3 Units) - C

Comparative study of the organization and implementation of a variety of programming languages and language features. Design principles are explored and applied in a historical review of major languages. Procedural, functional, logic-based, object-oriented, and parallel languages. Research issues such as polymorphism, formal semantics and verification explored in depth.

CSC 826 ARTIFICIAL INTELLIGENCE: (3 Units) - E

In depth study of some few major areas historically considered to be part of artificial intelligence. In particular, detailed coverage will be given to the design considerations involved in the following applications: automatic theorem proving, natural language understanding and machine learning.

CSC 828 DIGITAL PICTURE PROCESSING: (3 Units) - E

Basic concepts of image formation and image analysis: image geometry, sampling, filtering, edge detection, Hough transformation, region extraction and representation, extracting and modeling three-dimensional objects. Students will be assigned analytical and programming assignments to explore these concepts.

CSC 832 MICROPROCESSOR SYSTEMS: (3 Units) – E

Microprocessor, evolution, types and architecture. Micro-programming. Microprocessor system connections, timing, trouble shooting and interrupt. Digital interfacing. Analogue interfacing and industrial control, DMA, DRAM, Cache memories, co-processors and EDA tools, Microprocessor system peripherals. Data communications and network

CSC 844 SEMINAR: (2 Units) - C

Students are expected to choose current topics in areas of their interest and they will give presentation and be examined.

CSC 871 RESEARCH METHODOLOGY: (2 Units) - C

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. Research project formulation and proposal writing. Research techniques: analytical; experimental. Literature review.

CSC 872 MANAGEMENT AND ENTREPRENEURSHIP (2 Units) - C

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

CSC 899 RESEARCH THESIS: (6 Units) - C

Each student will be allocated to a supervisor. Students will then be required to submit a written project proposal to the supervisor for review. The proposal should give a brief outline of the project's aim, objective, problem definition, methods and computer resources needed. At the end of the project, students are required to write and submit a thesis for an oral examination by the Departmental Panel of Examiners and moderated by a University appointed External Examiner.

RESOURCE PERSONNELS AND THEIR AREAS OF RESEARCH INTEREST

S/N	NAME	QUALIFICATIONS	DESIGNATION	AREAS OF RESEARCH INTEREST
1	Rahman, M. A.	BSc, MSc, PGDE, PhD	Senior Lecturer & Ag. HOD	Computational Methods, Web Services, Information Systems and Computer Science Education
2	Aribisala, B. S.	BSc, MSc, PTLLS , PhD	Professor	Medical image analysis, computer vision, artificial intelligence, machine learning, magnetic resonance imaging and brain imaging
2	Ajetunmobi, M.O.	BSc, MSc, PhD	Professor	Algebraic Topology, Geometry Computing

3	Adekoya, A. F.	BSc, MSc, PGDE, PhD	Associate Professor	Artificial Intelligence and Machine Learning
4	Longe, O. B.	BSc, MSc, PhD	Associate Professor (Adjunct)	Social & Enterprise informatics, Cyber Security, Computer Network
5	Akinnuwesi, B. A.	BSc, MSc, PhD	Senior Lecturer	Information System, Expert System, Data Mining, Computer Networking
6	Akanbi, M. A.	BSc, MSc, PhD	Senior Lecturer	Numerical Analysis and Computation
7	Adewole, A. P.	BSc, MSc, PhD	Senior Lecturer (Adjunct)	Algorithm Design & Analysis, Data Structures, Data Mining & Data Warehousing and Artificial Intelligence
8	Olabode, O.	BSc, M.Tech., PhD	Senior Lecturer (Adjunct)	Artificial Intelligence, Computer Networking, Distributed Database System
9	Adenowo A. A.	BSc, MSc, PhD	Lecturer I	Information System, Application Development
10	Enikuomehin A. O.	BSc, MSc, PhD	Lecturer I	Natural language Processing, Software Application Development and Database Management Systems, Medical Image Analysis and Processing
11	Folajimi, Y.	BSc, MSc, PhD	Lecturer I (Adjunct)	Artificial Intelligence, Digital game-based learning, intelligent tutoring systems, Human-Computer Interaction, Social Learning, Machine Learning

2. DOCTOR OF PHILOSOPHY (PhD) IN COMPUTER SCIENCES

Duration of Programme

The PhD programme in computer sciences is a full time programme and runs for a minimum of six semesters and maximum of eight semesters.

The Admission requirements

The criteria for admission into the PhD in Computer Sciences programme will be as follows, provided that the candidate has five credit passes including English, Mathematics Physics and any two science related subjects. Note that all the conditions below must be satisfied.

a. Candidate must have BSc. degree in Computer Sciences or PGD in Computer Sciences from Lagos state university or a recognised university with a minimum of 3.0 CGPA.
b. Candidate with MSc in computer sciences of the Lagos state university or its equivalent from a recognised university with a minimum of 4.0 CGPA and thesis score not lower than 60% (B).
c. Candidate must demonstrate adequate intellectual capacity, maturity, effective decision making and problem solving potentials.

Qualifying Examination

All candidates seeking admission to our PhD computer sciences programme are required to obtain an admission form from the postgraduate school and may be subjected to a qualifying examination / interview or both. Candidate's performance in the qualifying examination will be used by the department to select students who will be recommended to the postgraduate school for provisional admission into the program. Note that some PhD candidates may be required to take some courses at our MSc programme if such is found to be necessary for the purpose of the candidate's research.

Programme Requirements (Where Applicable)

The PhD in computer sciences programme is primarily by research. However, based on the student supervisor's advise and in conjunction with the departmental postgraduate committee, some courses of not more than 12 credit units may be prescribed to be taken by the candidate. Where such prescription has been made, the candidate will be required to register for the prescribed courses, attend lectures and sit for examinations. The grades from the courses will be used to compute the student's CGPA which will consequently be used to determine the standing of the student.

a. Good Standing
To be in good standing, a student must in each semester have a Cumulative Grade Point Average (CGPA) of not less than 4.00

b. Withdrawal
A student whose CGPA is below 4.00 at the end of two consecutive semesters shall be withdrawn from the programme

c. Pass Mark
The minimum pass mark in any course shall be 60%

Requirements for Graduation

As mentioned under the programme requirements, the PhD in computer science programme is primarily by research. However, departmental postgraduate committee and the student supervisor (s) may prescribe some courses of not more than 12 credit units to be taken by the candidate. To qualify for the award of PhD degree in computer science, candidates must:

a. Pass all the prescribed courses (where applicable) with a minimum of CGPA of 4.0
b. Present at least two seminars on topics relevant to his/her research topic.
c. Submit and successfully defend A PhD thesis of 12 credit units before a panel of internal and external examiners.
d. Satisfy all other requirements stipulated by the postgraduate school of the Lagos state university.

COURSE DESCRIPTIONS FOR THE PhD PROGRAMME

Note: The PhD course descriptions presented below are the same with the MSc. course descriptions but re-coded to reflect that they are taken at higher level i.e. PhD level. As mentioned in the PhD admission requirements, the courses are not compulsory for all PhD students, but for students who might be advised to take some courses by the departmental PG committee and the students' supervisors.

CSC 901 ADVANCED OPERATING SYSTEMS (3 Units)

Structural design of an operating system: process model, inter-process communication, synchronization mechanisms, resource management, and scheduling. Protection issues. Implementation issues of modern operating systems. Distributed operating systems. Deadlock detection, recovery, and avoidance. Case studies and Project (s)

CSC 903 ADVANCED COMPUTER ALGORITHMS (3 Units)

Review of data structures; linear data structures, hashing, trees, graphs, recursion. Complexity classes; empirical measurements of performance; time and space tradeoffs analysis. Algorithmic strategies: Brute-force algorithms; greedy algorithms; divide-and-conquer; backtracking; branch-and-bound; minimum spanning tree, heuristics, pattern matching and string/text algorithms; numerical approximation algorithms. Tractable and intractable problems.

CSC 904 ADVANCED SOFTWARE ENGINEERING (3 Units)

Software Engineering and its place as an engineering discipline. Life cycle of software system: Requirements analysis, development, operation and maintenance, Software metrics: Portability, Re-usability, Correctness, Reliability, Efficiency, Usability, Integrity, Maintainability and Flexibility. Software quality and testing. Software architecture: architecture description languages, pattern-oriented software architecture, component-based development, distributed software architecture using middleware, enterprise application integration, architecture for mobile and pervasive systems and model driven architecture. Advanced modeling: UML extension mechanisms, object constraint language and model checking. Software project management: Study of interpersonal process decision making styles, problem solving concepts and procedures, creative effort, conflict resolution, leadership and assessment. Concepts of motivation, team work and group dynamics. Software engineering and law: intellectual property law, professional ethics and code of conduct. Patents, trademarks, copyright, trade secrets, privacy and confidentiality, contracts and licensing, government regulations, global legal issues including internet law and cyber crime. Overview of open source software.

CSC 905 COMPUTER COMMUNICATION AND NETWORKS: (3 Units)

Channels and channel capacity; introduction to information theory; sharing network resources: telecommunication history; circuit switching and packet switching; multiplexing; FDM, TDM, statistical multiplexing; virtual circuits and datagrams; advantages and disadvantages; sharing the medium: Aloha, CSMA (persistent and non-persistent), CSMA-CD, token passing, CDMA, wireless LANs and simple performance analysis; dealing with errors; errors, coding and redundancy; hamming theory of codes; CRCs, ARQ protocols; CR selective retransmission and flow control; internet: ISPs, datagram forwarding; the DNS; IPv4; addressing and forwarding; encapsulation and address resolution; TCP and UDP; ports and congestion controls; example applications; modeling data networks: services and protocols; layered architectures, the OSI 7-layer model; introduction to queue theory; physical media; LANs and bridging; WANs and point-to-point links; routing; addressing and routing in the internet; end-to-end communication in the internet; and application protocols. Cyber space technology: Cyber Crime, Cyber Security and models of Cyber Solution.

CSC 908: ADVANCED COMPUTER ARCHITECTURE: (3 Units)

Advanced computer architecture including discussion of instruction set design (RISC and CISC), virtual memory system design, memory hierarchies, cache memories, pipelining, vector processing, I/O subsystems, co-processors, and multiprocessor architectures. Case studies of current systems. Prerequisite: Undergraduate Computer Architecture.

CSC 909 DATABASE SYSTEMS: (3 Units)

A brief introduction to database concepts: file systems and databases, and the relational database model; design concepts and implementation: entity relationship (E-R) modeling; normalization of database tables and structured query language; database design and implementation. Transaction management and concurrency control and distributed database management systems; database privacy, security, failure and recovery. Object oriented databases; client / server systems; data warehouse; data mining; databases in electronic commerce; web database development and database administration.

CSC 915 OPERATION RESEARCH: (3 Units)

Revised simplex method, matrix method of solution, integer programming problems, non-linear programming problems, selected case studies and computer implementations, sensitivity analysis for linear programming problems

CSC 912 MOBILE AND ADAPTIVE SYSTEMS (3 Units)

Introduction and overview; properties of wireless; PANs, LANs and WANs: Ad-hoc and infrastructure networks; physical constraints and limitations (transmission and reception), network structures and architectures, including hand-off and mobility support at the physical/link level; example of technologies at physical /link layers: PANS Bluetooth, LANS IEEE 802.11, HiperLAN, basic GSM and GPRS network structures and protocol architectures, next generation wireless overview including UMTS, IMT-2000 and W-CDMA; mobile IP: mobile IPv4 and mobile IPv6, problems with routing, quality of service and security; overview of use of intelligence in mobile systems and power management issues; file systems: CODA and the like and mobile infrastructure support. Adaptive and re-configurable systems, mobile multimedia and its relationship to proxying, context sensitive applications, ubiquitous computing, pervasive computing and ambient networking, overlays networks and vertical hand-offs, programmable networking and applications for mobile systems, code mobility and control signaling.

CSC 916 HUMAN COMPUTER INTERACTION: (3 Units)

Positive and negative effects of the computers and ICT on human beings and the societies. Computing as a profession, organizations using computers, sociology impacts of computers, egonometrics, individuals and computers, computer as an audit tool, computers in banking, computer based information systems and telecommunications, computers in consultancy services, design and construction, education, government, insurance, stock-brokerage, legal and medical professions.

CSC 918 ADVANCED STATISTICS: (3 Units)

Linear regression and correlation analysis, Curve Fitting. Multiple regression, forecasting, sampling theory. Test of Hypothesis (the null and the alternative hypothesis, F-test, t-test, chi square test, analysis of variance – one-factor experiment, two-factor experiment); Random numbers (distribution – probability distribution, binomial distribution, normal distribution, bivariate normal distribution, Beta distribution); Non parametric tests (sign test, mann-Whitney U test, Kruskal-Wallis H Test, H test corrected for ties); Use of SPSS

CSC 922 DESIGNING COMPLEX SOFTWARE SYSTEMS (3 Units)

Designing new computational systems and the software that drives them is both hard and interesting. One important style of computer science research, often called experimental systems research, revolves around such design activities. Research in this style seeks to advance our understanding of, and our ability to create, general computer systems that support the development and use of more domain-specific applications.

CSC 924 PROGRAMMING LANGUAGES: (3 Units)

Comparative study of the organization and implementation of a variety of programming languages and language features. Design principles are explored and applied in a historical review of major languages. Procedural, functional, logic-based, object-oriented, and parallel languages. Research issues such as polymorphism, formal semantics and verification explored in depth.

CSC 926 ARTIFICIAL INTELLIGENCE: (3 Units)

In depth study of some few major areas historically considered to be part of artificial intelligence. In particular, detailed coverage will be given to the design considerations involved in the following applications: automatic theorem proving, natural language understanding and machine learning.

CSC 927 ADVANCED COMPUTER VISION: (3 Units)

Analysis of advanced topics in automated reconstruction of imaged objects and computer interpretation of imaged objects; techniques for three dimensional object reconstruction; computing motion parameters from sequences of images; computational frameworks for vision tasks such as regularization, and stochastic relaxation; approaches for autonomous navigation. Dept image analysis; novel imaging techniques and applications; and parallel architectures for computer vision.

CSC 928 DIGITAL PICTURE PROCESSING: (3 Units)

Basic concepts of image formation and image analysis: image geometry, sampling, filtering, edge detection, Hough transformation, region extraction and representation, extracting and modeling three-dimensional objects. Students will be assigned analytical and programming assignments to explore these concepts.

RESOURCE PERSONNELS AND THEIR AREAS OF RESEARCH INTEREST

S/N	NAME	QUALIFICATIONS	DESIGNATION	AREAS OF RESEARCH INTEREST
1	Rahman, M. A.	BSc, MSc, PGDE, PhD	Senior Lecturer & Ag. HOD	Computational Methods, Web Services, Information Systems and Computer Science Education
2	Aribisala, B. S.	BSc, MSc, PTLLS , PhD	Professor	Medical image analysis, computer vision, artificial intelligence, machine learning, magnetic resonance imaging and brain imaging
2	Ajetunmobi, M.O.	BSc, MSc, PhD	Professor	Algebraic Topology, Geometry Computing
3	Adekoya, A. F.	BSc, MSc, PGDE, PhD	Associate Professor	Artificial Intelligence and Machine Learning
4	Longe, O. B.	BSc, MSc, PhD	Associate Professor (Adjunct)	Social & Enterprise informatics, Cyber Security, Computer Network
5	Akinnuwesi, B. A.	BSc, MSc, PhD	Senior Lecturer	Information System, Expert System, Data Mining, Computer Networking
6	Akanbi, M. A.	BSc, MSc, PhD	Senior Lecturer	Numerical Analysis and Computation
7	Adewole, A. P.	BSc, MSc, PhD	Senior Lecturer (Adjunct)	Algorithm Design & Analysis, Data Structures, Data Mining & Data Warehousing and Artificial Intelligence
8	Olabode, O.	BSc, M.Tech., PhD	Senior Lecturer (Adjunct)	Artificial Intelligence, Computer Networking, Distributed Database System

BUDGET PROPOSAL FOR PGD, MSc. and PhD COMPUTER SCIENCES

Projected Income

School Fees - PGD.

Fees: N120,000 for Yr I and N50,000 for Yr II
No of students: 60 – 2013/2014, 65 – 2014/2015, 70 – 2015/2016

	2013/2014	**2014/2015**	**2015/2016**
Current students	60 x 120,000	65 x 120,000	70 x 120,000
Returning students	-	60 x 50,000	65 x 50,000
Returning students	-	-	60 x 50,000
Sum	**N7,200,000**	**N10,800,000**	**N14,650,000**

School Fees - MSc.

Fees: N150,000 for Yr I and N50,000 for Yr II
No of students: 30 – 2013/2014, 35 – 2014/2015, 40 – 2015/2016

	2013/2014	**2014/2015**	**2015/2016**
Current students	30 x 150,000	35 x 150,000	40 x 150,000
Returning students	-	30 x 50,000	35 x 50,000
Returning students	-	-	30 x 50,000
Sum	**N4,500,000**	**N6,750,000**	**N9,250,000**

School Fees - PhD.

Fees: N150,000 for Yr I, N90,000 for Yr II and N150,000 for Yr III
No of students: 5 – 2013/2014, 7 – 2014/2015, 9 – 2015/2016

	2013/2014	**2014/2015**	**2015/2016**
Current students	5 x 150,000	7 x 150,000	9 x 150,000
Returning students	-	5 x 90,000	7 x 90,000
Returning students	-	-	5 x 150,000
Sum	**N750,000**	**N1,500,000**	**N2,730,000**

Expected Total Revenue: PGD

S/N	**Basis**	**2013/2014**	**2014/2015**	**2015/2016**
1.	Sales of forms	N6,500 x 100 =N650,000	N6,500 x 100 =N650,000	N6,500 x 100 =N650,000
2.	Acceptance fees	N15,000 x 60 =N900,000	N15,000 x 65 =N975,000	N15,000 x 70 =N1,050,000
3.	School fees	N7,200,000	N10,800,000	N14,650,000
	Total	**N8,750,000**	**N12,425,000**	**N16,350,000**

Expected Total Revenue: MSc

S/N	**Basis**	**2013/2014**	**2014/2015**	**2015/2016**
1.	Sales of forms	N6,500 x 100 =N650,000	N6,500 x 100 =N650,000	N6,500 x 100 =N650,000
2.	Acceptance fees	N15,000 x 30 =N450,000	N15,000 x 35 =N525,000	N15,000 x 40 =N600,000
3.	School fees	N4,500,000	N6,750,000	N9,250,000
	Total	**N5,600,000**	**N7,925,000**	**N10,500,000**

Expected Total Revenue: PhD

S/N	Basis	2013/2014	2014/2015	2015/2016
1.	Sales of forms	N6,500 x10 =N65,000	N6,500 x 10 =N65,000	N6,500 x 10 =N65,000
2.	Acceptance fees	N15,000 x 5 =N75,000	N15,000 x 7 =N105,000	N15,000 x 9 =N135,000
3.	School fees	N750,000	N1,500,000	N2,730,000
	Total	**N890,000**	**N1,670,000**	**N2,930,000**

EXPENDITURE

PGD

S/N	Basis	2013/2014	2014/2015	2015/2016
1.	Proposed students' supervision @ N10,000 per student	N10,000 x 60 N600,000	N10,000 x 65 N650,000	N10,000 x 70 N700,000
2.	Examination materials and consumables (Examination scripts, printing paper, toners, etc), examination supervision.			
	(a) 1st Semester	N250,000	N250,000	N300,000
	(b) 2nd Semester	N250,000	N250,000	N300,000
	(c) Seminar	N100,000	N100,000	N150,000
3.	(d) Administration of programme (programme officer honorarium, paper, other expenses)	N500,000	N500,000	N500,000
6.	**Total**	**N1,700,000**	**N1,750,000**	**N1,950,000**

MSc.

S/N	Basis	2013/2014	2014/2015	2015/2016
1.	Proposed students' supervision @ N10,000 per student	N10,000 x 30 N300,000	N10,000 x 35 N350,000	N10,000 x 40 N400,000
2.	Examination materials and consumables (Examination scripts, printing paper, toners, etc), examination supervision.			
	(c) 1st Semester	N250,000	N250,000	N300,000
	(d) 2nd Semester	N250,000	N250,000	N300,000
	(c) Seminar	N100,000	N100,000	N150,000
3.	(d) Administration of programme (programme officer honorarium, paper, other expenses)	N500,000	N500,000	N500,000
4.	External Examiner fees	N50,000	N50,000	N50,000
5.	Honoraria for Associate Lecturers	N1,500,000	N1,500,000	N1,500,000
6.	**Total**	**N2,950,000**	**N3,000,000**	**N3,150,000**

PhD.

S/N	Basis	2013/2014	2014/2015	2015/2016
1.	Examination materials and consumables	N100,000	N100,000	N100,000
2.	Organisation of Seminars	N50,000	N50,000	N50,000
3.	PhD Supervision allowance	N100,000 x 5 N500,000	N100,000 x 7 N700,000	N100,000 x 9 N900,000
4.	Oral Examination			
	(a) External Examiner			

		- Fees - Transportation allowance/km - Overnight allowance			N75,000 x 5 N375,000 N75,000 x 5 N375,000 N40,000 x 5 N200,000
	(b)	Panel Chairman			N50,000 x 5 N250,000
	(c)	Other members of the panel			N30,000 x 5 N150,000
	(d)	PG Rep/Sec			N5,000 x 5 N25,000
	Total		**N650,000**	**N850,000**	**N2,455,000**

SUMMARY OF REVENUE AND EXPENDITURE

S/N	Programme	Revenue	Expenditure	Profit
1.	**PGD**	N	N	N
	2013/2014	8,750,000	1,700,000	7,050,000
	2014/2015	12,425,000	1,750,000	10,675,000
	2015/2016	16,350,000	1,950,000	14,400,000
2.	**MSc**	N	N	N
	2013/2014	5,600,000	2,950,000	2,650,000
	2014/2015	7,925,000	3,000,000	4,925,000
	2015/2016	10,500,000	3,150,000	7,350,000
3.	**PhD**	N	N	N
	2013/2014	890,000	650,000	240,000
	2014/2015	1,670,000	850,000	820,000
	2015/2016	2,930,000	2,455,000	475,000