COLLEGE OF PHYSICAL SCIENCES
(COLPHYS)

About The College

The College of Physical Sciences (COLPHYS) came into existence in 2014 following the demerger of the former College of Natural Sciences (COLNAS) into two. As of the time of writing this, COLPHYS is made up of five Departments each running four years Bachelor of Science Degree programmes that are fully accredited by the National Universities Commission (N.U.C.). These Departments are strategic in carrying out the University's mandate of producing skilled manpower towards sustainable development in agriculture, economy and the environment.

The Departments in COLPHYS are:

- Department of Chemistry
- Department of Computer Science
- Department of Mathematics
- Department of Physics
- Department of Statistics

Vision

To be the foremost college known for development of world-class human and materials in the fields of physical sciences.

Mission

Development of curricula and preparation of science graduates with adequate knowledge and skills required to make meaningful contributions to national development

Dean's Office

Name	Qualifications	Designation
A. O. Mustapha	B.Sc., M.Sc. (Zaria) Ph.D. (Nairobi)	Professor and Dean
A. K. Akinlabi	B.Sc. ED.(Lagos) M.Sc. (Benin), M.Eng. (London) Ph.D. (Benin)	Professor and Deputy Dean

DEPARTMENT OF CHEMISTRY
B. Sc. DEGREE IN CHEMISTRY

Introduction:
The Department of Chemistry offers a degree programme in Bachelor of Science (B.Sc), Masters (M.Sc) and Doctor of Philosophy (Ph.D).

The Department of Chemical Sciences was established in 1988 at the inception of UNAAB. In 2001, the Department of Chemical Sciences was split into Biochemistry and Chemistry. The courses in the Department of Chemistry are designed to lead to a B.Sc. degree over a four years period.

The industrial training (attachment to Industry) will be for six months and will commence immediately at the beginning of second semester in the third year of the programme and terminate at the end of holidays for that session. The departmental programme has therefore been designed so as to train sound industrially and research – oriented graduates for our chemical and related manufacturing industries.

Teaching and Research in the Department of Chemistry, University of Agriculture, Abeokuta have always been of a high standard and many past students have consistently exhibited this in Postgraduate performance both internally and externally.

Aims and Objectives
The objectives of the department's undergraduate programmes are geared towards providing courses that will lead to a well-balanced training up to a bachelor's degree in chemistry. The courses are designed to produce graduates who are very conversant in a broad sense with the theories, principles and application of chemistry, so that they could be thoroughly resourceful, adaptive and innovative in their later employment whether in the field of pure chemistry research, as lecturers in Tertiary Institutions, Industry or develop initiative to be self-employed. Specifically, the objectives are:

* To train chemists with sustained interest and enthusiasm in chemistry and its applications.
* To train chemists with a broad and balanced base of chemical knowledge and practical skills that is required for Postgraduates Studies and Research.
* To train chemists with a range of skills applied in chemical and non-chemical areas that can provide confidence for employment.

Academic Staff

NAME	QUALIFICATION	SPECIALIZATION	DESIGNATION
A. A. Lasisi	B.Sc. (Benin), M.Sc., Ph.D.(Ibadan)	Organic Chemistry	Reader and Ag. HOD
I. C. Eromosele	B.Sc. (Ibadan), M.Sc. (Manchester), Ph.D. (Dublin)	Industrial/ Polymer Chemistry	Professor
F. T. Taiwo	B.Sc. (Ibadan), M.Sc., Ph.D.(Leicester)	Biophysical Chemistry	Professor
Catherine O. Eromosele	B.Sc. (Benin), M.Sc. (Manchester), Ph.D. (Benin)	Industrial Chemistry	Professor
A. K. Akinlabi	B.Ed. (Lagos), M.Sc. (Benin), M.Eng. (London), Ph.D. (Benin)	Industrial/Polymer Chemistry	Professor
L. A. Arogundade	B.Sc., M.Sc. (Ibadan), Ph.D.(Abeokuta)	Industrial/Applied Chemistry	Professor
E. O. Dare	B.Sc., M.Sc., Ph.D. (Ilorin)	Industrial/Material Chemistry	Professor
S. Adewuyi	B.Sc. (Abeokuta), M.Sc. (Ibadan),Ph.D. (Abeokuta)	Inorganic/Material Chemistry	Reader
Mopelola A. Idowu	B.Sc., M.Sc. (Ibadan), Ph.D.(Rhodes)	Physical Chemistry	Reader
T. A. Afolabi	B.Sc. (Abeokuta), M.Sc., Ph.D. (Ibadan)	Industrial/Biopolymer Chemistry	Senior Lecturer
A. I. Adeogun	B.Sc. (Ilorin), M.Sc., Ph.D.(Ibadan)	Physical Chemistry	Senior Lecturer
S. A. Amolegbe	B.Sc. (Abeokuta), M.Sc., Ph.D.(Ilorin)	Inorganic Chemistry	Senior Lecturer
O. S. S. Sojinu	B.Sc. (Abeokuta), M.Sc., Ph.D. (Ibadan)	Organic Chemistry	Senior Lecturer
Caroline A. Akinremi	B.Sc. (Ilorin), M.Sc. (Ibadan), Ph.D. (Ilorin)	Inorganic/Analytical Chemistry	Senior Lecturer
Temilade F. Akinhanmi	B.Sc. (Ibadan), M.Sc. (Liverpool), Ph.D. (Abeokuta)	Analytical Chemistry	Senior Lecturer
F. O. Oladoyinbo	B.Sc., M.Sc. (Abeokuta), Ph.D.(Reading)	Industrial Chemistry	Lecturer I
Adebimpe. D. Adesina	B.Sc., M.Sc. (Lagos)	Physical Chemistry	Assistant Lecturer
F. Akinwunmi	B.Sc., M.Sc. (Abeokuta)	Analytical Chemistry	Assistant Lecturer

100 Level: First Semester

Course Code	Course Title	U	L	T	P
BIO101	General Biology I	2	2	-	-
BIO103	Introductory Physiology I	2	2	-	-
BIO191	Biology Practical I	1	-	-	1
CHM101	Introductory Physical Chemistry	3	2	1	-
CHM191	Practical Chemistry I	1	-	-	1
GNS101	Use Of English	2	2	-	-
GNS111	Introduction To Social Problems	1	1	-	-
MTS101	Algebra	3	2	1	-
PHS101	General Physics I	3	2	1	-
PHS191	Physics Laboratory I	1	-	-	1
Total		**19**	**13**	**3**	**3**

100 Level: Second Semester

Course Code	Course Title	U	L	T	P
BIO102	General Biology Ii	2	2	-	-
BIO192	Biology Practical Ii	1	-	-	1
CHM102	Introductory Organic Chemistry	2	2	-	-
CHM104	Introductory Inorganic Chemistry	2	2	-	-
CHM192	Practical Chemistry Ii	1	-	-	1
CSC102	Introduction To Algorithm Techniques	2	2	-	-
GNS102	Introduction To Nigerian History	1	1	-	-
MTS102	Calculus And Trigonometry	3	2	1	-
PHS102	General Physics Ii	3	2	1	-
PHS192	Physics Laboratory Ii	1	-	-	1
	Total	**18**	**13**	**2**	**3**

200 Level: First Semester

Course Code	Course Title	U	L	T	P
CHM211	Inorganic Chemistry I	2	2	-	-
CHM221	Basic Organic Chemistry I	2	2	-	-
CHM231	Physical Chemistry I	2	2	-	-
CHM251	Industrial Chemical Process I	2	2	-	-
CHM291	Experimental Chemistry I	1	-	-	1
CHM293	Experimental Inorganic Chemistry	1	-	-	1
CSC203	Computer Programming I	3	2	-	1
MTS 241	Mathematical Methods I	3	2		1
	Electives	6	6		
	Total	**22**	**18**	**-**	**4**
Electives					
STS201	Statistics for Agricultural & Biological Sciences	3	2	1	-
CHM233	Chemical Physics	1	1	-	-
CHM 243	Inorganic Chemicals	2	2	-	-
CHM 245	Forensic Chemistry	2	1	-	1
PHS 251	Introductory Modern Physics	3	2	1	-

200 Level: Second Semester

Course Code	Course Title	U	L	T	P
CHM202	Introductory Analytical Chemistry	3	2	1	-
CHM212	Basic Inorganic Chemistry II	2	2	-	-
CHM222	Basic Organic Chemistry II	2	2	-	-
CHM232	Physical Chemistry II	2	2	-	-
CHM292	Experimental Chemistry II	1	-	-	1
ETS206	Entrepreneurship Studies And Change Management .	2	2	-	-
GNS201	Writing And Literary Appreciation	1	1	-	-
GNS202	Elements Of Politics And Government	1	1	-	-
GNS203	USE OFLIbrary	1	1	-	-
GNS204	Logic And History of Science	2	2	-	-
MTS232	Ordinary Differential Equations	3	2	1	-
PHS364	Energy & Environment	1	1	-	-
	Electives	3	2	-	1
Total		**24**	**20**	**2**	**2**
Electives					
CHM 226	Introduction To Nanotechnology	2	2	-	-
CHM 228	Colour Chemistry	1	1	-	-
PHS 222	Thermal Physics	3	2	-	1

300 Level: First Semester

Course Code	Course Title	Unit	L	T	P
CHM 301	Polymer Chemistry & Rubber Technology	2	2	-	-
CHM 303	Instrumental Methods Of Analysis	2	1	-	1
CHM 305	Environmental Chemistry	2	2	-	-
CHM 307	Separation Techniques	2	2	-	-
CHM 309	Industrial Raw Materials and Inventory	2	1	-	1
CHM 311	Inorganic Chemistry III	2	2	-	-
CHM 313	Pesticide Chemistry	2	2	-	-
CHM 321	Chemistry Of Macromolecules	2	1	1	-
CHM 331	Physical Chemistry III	3	2	1	-
CHM 333	Atomic And Molecular Spectroscopy	2	2	-	-
CHM 391	Experimental Organic Chemistry	1	-	-	1
CHM 393	Experimental Physical Chemistry	1	-	-	1
CHM 395	Experimental Inorganic Chemistry	1	-	-	1
	Elective	2	2	-	-
Total		**26**	**19**	**2**	**5**
Electives					
CHM 315	Non-Aqueous Solvent	2	-	-	-

300 Level: Second Semester -Students' Industrial Work Experience Scheme (SIWES)

Course Code	Course Title	Unit	L	T	P
CHM 392	Industrial Training / Field Work	4	-	-	4
CHM 394	Inspection / Visitation	4	-	-	4
CHM 396	Siwes Report	4	-	-	4
CHM 398	Seminar	4	-	-	4
	Total	**16**			**16**

400 Level: First Semester

Course Code	Course Title	U	L	T	P
CHM 401	Analytical Chemistry III	3	3	-	-
CHM 403	Applied Spectroscopy	2	1	-	1
CHM 411	Coordination Chemistry	2	2	-	-
CHM413	Mechanisms Of Organic Reaction	2	2	-	-
CHM 415	Chempreneurship	2	-	-	2
CHM 421	Organic Synthesis	2	2	-	-
CHM 431	Reaction Kinetics	2	2	-	-
CHM 443	Natural Product Chemistry	2	2	-	-
CHM 491	Advanced Experimental Chemistry	1	-	-	1
	Electives	4	4		
Total		**22**	**18**		**4**
Electives					
CHM 423	Photochemistry & Pericyclic Reactions	2	2	-	-
CHM 425	Physical Organic Chemistry	2	2	-	-
CHM 433	Radionuclear Chemistry	2	2	-	-
CHM437	Surface And Colloidal Chemistry	2	2	-	-

400 Level: Second Semester

Course Code	Course Title	U	L	T	P
CHM 404	Polymer Technology	2	2	-	-
CHM 406	Industrial Chemical Process Ii	2	2	-	-
CHM 422	Heterocyclic Chemistry	2	2	-	-
CHM 424	Organometallic Chemistry	2	2	-	-
CHM 432	Advanced Electrochemistry	2	2	-	-
CHM 498	Seminar	1	1	-	-
CHM 499	Research Project	6	-	-	6
	Electives	2	2	-	-
	Total	**19**	**13**	**-**	**6**
Electives					
CHM 412	Chemistry Of Lanthanides & Actinides	2	2	-	-
CHM 408	Industrial Chemical Technology	2	2	-	-
CHM 412	Chemistry Of Lanthanides & Actinides	2	2	-	-
CHM 408	Industrial Chemical Technology	2	2	-	-

COURSE SYNOPSES

CHM 101:INTRODUCTION TO PHYSICAL CHEMISTRY (3 Units)

Atoms, molecules and structures. Electronic configuration. Periodicity and building up of the periodic table. Chemical reactions, chemical equations and stoichiometry. Bonding and intermolecular forces. Kinetic theory of matter; derivation and

calculation of all the laws involved. Thermochemistry and simple calculations based on Hess's law. Rate of reaction. Chemical equilibrium. Oxidation-Reduction reaction. Chemical kinetics, equilibra and related simple calculation . Important applications of equilibra like pH, Solubility. Solubility of ionic solids. Electrochemistry and workings of various cells, Corrosion.

CHM 102: INTRODUCTION TO ORGANIC CHEMISTRY II (2 Units)

Tetravalency of carbon. Structure, molecular composition and variety of carbon compounds. Functional group classes of carbon compounds. The chemistry of alkanes and petroleum, alkenes including ozonolysis, alkynes, benzene, alcohols including phenols, aldehydes, ketones, acids, amines and their derivatives. Structure of simple sugars, starch and cellulose, peptides and proteins. Synthetic polymers from various classes of compounds. Mechanisms of reactions discussed in all cases and uses of compounds.

CHM 104: INTRODUCTION TO INORGANIC CHEMISTRY (2 Units)

Hybridization and shapes of simple molecules including carbon compounds. Extraction of the metals. Comparative Chemistry of group 1A (alkali metals). IIA (alkaline earth metals) and IVA (carbon group) elements. Introduction to transition metal chemistry and nuclear chemistry. Acids, bases and salts.

CHM 191: PRACTICAL CHEMISTRY I (1 Unit)

CHM 192: PRACTICAL CHEMISTRY II (1 Unit)

CHM 202: INTRODUCTORY ANALYTICAL CHEMISTRY (3 Units)

Review of Fundamental concepts, Sampling techniques, statistical treatment of analytical data, accuracy, precision, errors, students function, rejection of outliers.

Gravimetric analysis: Type of precipitate/crystal formation, contamination and appropriate handling of precipitates/crystals, coprecipitation, precipitation from homogeneous solution.

Titrimeric analysis: Acid-base, Redox, complexometric precipitation and non-aqueous titrations; indicators.

Colorimetry: Spectrophotometric reagents, elementary visible spectrophotometry; spectrophotometric titrations.

CHM 211: INORGANIC CHEMISTRY I (2 Units)

Wave mechanical treatment of atomic structure, Periodicity and periodic table. Chemical bonding. Bonding theories; Valency bond theory molecular orbital theories. Inorganic Stereochemistry, Nomenclature of Inorganic compounds. Chemistry of group IIIA, (Boron group), VA (Nitrogen group), noble gas. Introduction to first row

transition metal chemistry.

CHM 212: INORGANIC CHEMISTRY II (2 Units)

Introduction to study of non-aqueous solvents. Introduction to group theory and symmetry. Inorganic energetics; ionic solids, inorganic application of standard reduction potentials. Concept of Hard and Soft acids and bases. Chemistry of groups VIA & VIIA and treatment of interhalogen.

CHM 215: STRUCTURE AND BONDING (2 Units)

Idea of quantum states, orbitals, shape; and energy. Simple valence theory, electronrepulsion theory, atomic spectra. Methods of determining molecular shape, bound lengths and angles. The structure and chemistry of some representative main group element compounds.

CHM 221: BASIC ORGANIC CHEMISTRY I (2 Units)

Principal series of organic compounds: Acyclic aliphatic, cyclic; carbocyclic e.g. aliphatic, alicyclic aromatic and heterocyclic (mere listing & classifying). Functional group chemistry; alcohols, phenol and ethers, carbonyl; nitro, amino, epoxides and sulphur compounds, acid and their derivatives , -unsaturated (carbonyl) compounds. Methods of preparation, physical and chemical properties of these compounds are to be treated. Introduction to organic reaction types: Substitution, Elimination, Addition and Re arrangement. Structure of Benzene and Aromaticity.

CHM 222: ORGANIC CHEMISTRY II (2 Units)

Methane, energy of activation and free radical substitution reaction in alkanes. Stereochemistry: Relative and absolute configuration. Racemization and resolution of racemic mixtures. Walden inversion, Geometrical isomerism, determination of configuration of geometrical isomers. Sterechemistry of amines and oximes. Conformational analysis. Polyfunctional compounds – dicarboxylic acids, hydoxy acids, 1, 3, - dicarbonyl compounds. Polynuclear Hydrocarbon; Synthesis and Reactions of:

(a) isolated ring systems – diphenyl, dibenzyle e.t.c.
(b) Condensed ring systems – naphthalene, anthracene and phenanthrene.

CHM 231: PHYSICAL CHEMISTRY I (2 Units)

The kinetic theory of gases. Molecular velocities and their distribution. Heat capacity and the equipartition of energy. First law of thermodynamics, kirchoffs equations, second law, computation of entropy for simple systems, free energy and spontaneity of reactions. Equilibrium constant. Vant Hoff isochore, chemical potentials and definitions. Third law of thermodynamics and its applications. Partition law and phase

equilibria.

CHM 232: PHYSICAL CHEMISTRY II (2 Units)

Ions in Solution: The Arrhenius theory. The conductivity of ions. Measurement of conductance and its applications.

Debye–Huckel theory of ions, Kohlrausch theory and Oswald dilution. The concept of activity and activity coefficient.

Solution of ions, Transport numbers, Colligative properties of solution. Reactions in solution involving Bronsted treatment of primary salt effects. E. M. F of cells and equilibrium constants chemical kinetics, rate laws, collision theory, transition state theory. Reaction coordinates, catalysis and mechanism of catalytic reaction.

CHM 233: CHEMICAL PHYSICS (1 Unit)

Theory of bonding in H_2^+ and H_2. Rotation and vibration of molecules. Heat capacities of crystals.

CHM 243: INORGANIC CHEMICALS (2 Units)

CHM 245: FORENSIC CHEMISTRY (2 Units

CHM 251: INDUSTRIAL CHEMICAL PROCESS 1 (2 Units)

Production of primary intermediates and synthesis of industrial organic chemicals. Pharmaceuticals. Fermentation process. Fossils and their uses. Plant and animal products. Nuclear, solar and hydrodynamic source of energy.

CHM 291: EXPERIMENTAL CHEMISTRY I (1 Unit)

CHM 292: EXPERIMENTAL CHEMISTRY II (1Unit)

CHM 293: EXPERIMENTAL INORGANIC CHEMISTRY (1 Unit)

CHM 301: POLYMER CHEMISTRY AND RUBBER TECHNOLOGY (2 Units)

CHM 303: INSTRUMENTAL METHODS OF ANALYSIS (2 Units)

- General principles of spectrometers
- UV– visible absorption spectroscopy theory, quantitative application of UV measurements.
- I R spectrophotometry, basic theory, solid liquid and gas samples. Group frequencies quantitative uses.
- Molecular fluorescence spectroscopy.
- Atomic spectroscopy, Absorption and emission, flame atomization.
- Refractometry and Polarimetry.

- NMR

CHM 305: ENVIRONMENTAL CHEMISTRY (2 Units)

Concepts of elementary cycles. Characteristics of the atmosphere. Sources, types and effects of environmental pollution. Water Chemistry. Composition of domestic wastes, water treatment. Global warming and its effects. Ozone layer and its functions. Depletion of ozone layer and its implications.

CHM 307: SEPARATION TECHNIQUES (2 Units)

Introduction to separation techniques. Principles of Chromatography: Column efficiency. Resolution and band spreading.

Classical liquid Chromatography HPLC, ion exchange, Gel permeation and gas.

Liquid chromatography. Solvent extraction including counter distribution and Electrophoresis.

Mechanism of separation. Paper and thin layer chromatography. Column chromatography;

CHM 309: INDUSTRIAL RAW MATERIALS AND RESOURCE INVENTORY (2 Units)

Survey of Nigeria's industries and their raw material requirements. Mineral chemistry. Fossils and their uses. Plant and animal products. Nuclear, solar and hydrodynamic source of energy. Potentials and applications of locally available raw materials as industrial feed-stocks.

CHM 311: INORGANIC CHEMISTRY III (2 Units)

Detail chemistry of d-block transition metal series. Introduction to coordination. E. g. Introduction to organometallic chemistry. Detail treatment of the electronic structure of transition metal, Lanthanide and actinides and the relationship to their physiochemical property.

CHM 313: PESTICIDE CHEMISTRY (2 Units)

The importance of pesticides in the agricultural development of the world. Classification and chemistry of pesticides. Brief treatment of:

- Environmental and ecological implication of pesticide usage
- Pesticides metabolism
- Pollution problems
- Pesticides residue analysis e.t.c.

CHM 321: CARBOHYDRATE CHEMISTRY (2 Units)

Classification, structure and nomenclature. Sugars. General reaction, preparations and reaction mechanisms Configurations. Empimerization.

CHM 323: BIOACTIVE ORGANIC COMPOUNDS (2 Units)

Treatment include Structure - activity relation and metabolism of Drug. Drugs treated include anti-malaria, anti-anxiety, anti-neo-plastic and diuretic agents. A study of compounds. Natural and Synthetic used for the cure and prevention of diseases.

CHM 327: MACROMOLECULAR CHEMISTRY (2 Units)

Introduction, symmetry, Conformations and configurations, chirality and resolution of racemic mixtures. Stereochemistry and biological activities, Stereoselectivity and Stereospecificity in Synthesis. The structure and brief Chemistry of mono-saccharides, polysaccharides, amino acids, proteins, nucleic and acid and DNA, synthetic polymers and detergents, physical methods in the determination of the structures and properties of Macromolecules, bimolecular spectroscopy and interaction in biological macromolecules. Purification of biological macromolecules.

CHM 331: PHYSICAL CHEMISTRY III (3 Units)

Chemical thermodynamics. Gibbs-Helmholtz equation. Phase equilibrium, Clausius-Clapeyron equation and applications. Thermodynamics treatment of solutions. Solubility of solids with temperature. The third law of thermodynamics. Maxwell-Boltzman-statistics. Boltzman distribution law, partition functions, heat capacities, entropy, equilibrium constants, rotational, vibrational and translational partition functions. Microstates and randomness. Calculation of thermodynamic equilibrium constant from partition functions. Ideal and non-ideal solutions. Introductory quantum chemistry.

CHM 332: NON-AQUEOUS SOLVENTS (2 Units)

Classification and general Characteristics Solute – solvent interaction, Protonic solvents, oxyhalide solvents, liquid halides, Dimethyl sulphurdioxide.

CHM 333: ATOMIC AND MOLECULAR SPECTROSCOPY (2 Units)

Rotational, vibrational and translational spectra of diatomic molecules. Electron spin and NMR Spectoroscopy. Application of UV, IR in elucidation of Structures of organic compounds.

CHM 391: EXPERIMENTAL ORGANIC CHEMISTRY (1 Unit)

CHM 392: INDUSTRIAL TRAINING AND FIELD WORKS (4 Units)

CHM 393: EXPERIMENTAL PHYSICAL CHEMISTRY (1 Unit)

CHM 394: SIWES SEMINAR PRESENTATION (4 Units)

CHM 395: EXPERIMENTAL INORGANIC CHEMISTRY (1 Unit)

CHM 396: **SIWES TECHNICAL REPORT** **(4 Units)**

CHM 398: SIWES LOG BOOK **(4 Units)**

CHM 401: ANALYTICAL CHEMISTRY III **(3 Units)**

Electroanalytical methods: Potentiometric, Voltammetry, Amperometry, Polarography, Conductometry, Colorimetric, Chromatographic analysis (gas and paper chromatography), Radiochemical methods, Fluorescence, technique. Solvent extraction.

CHM 403: APPLIED SPECTROSCOPY **(2 Units)**

UV-visible spectroscopy, IR Spectroscopy, NMR Spectroscopy and Mass Spectroscopy

CHM 404: POLYMER TECHNOLOGY **(2 Units)**

CHM 406: INDUSTRIAL CHEMICAL PROCESS II **(2 Units)**

CHM 408: INDUSTRIAL CHEMICAL TECHNOLOGY **(2 Units)**

CHM 411: COORDINATION CHEMISTRY **(2 Units)**

Isomerism of complexes. Theories of bonding: Valence bond, crystal field and Ligand field theories. Stereochemistry of complexes and John-Teller distortions. Stability of complex and chelate effect. Physical methods of structural investigation (Spectroscopic, magnetic and thermal properties). Preparations and reactions of complexes. Application of complexes.

CHM 412: CHEMISTRY OF LANTHANIDES & ACTINIDES **(2 Units)**

The elements and the position of the two series in the periodic table. Comparison of the two series. The electronic configuration and their sequence on oxidation state, size relationship, magnetic properties and colour. Chemical properties and structure of the elements and their compounds. Recovery and separation of the elements.

CHM 413: MECHANISMS OF ORGANIC REACTIONS **(2 Units)**

Fundamental concepts: Acids and Bases. Investigation of reaction mechanism by kinetic and non-kinetic metnods. Energy profile. Theory of reaction rates. Displacement reaction: Nucleophilic substitution at saturated carbon atom (SNI and SN2 mechanisims). Neighbouring group participation and molecular re-arrangements in electron deficient systems. Wagener-Meerwein transformation rearrangement to an aromatic nucleus. Wittig, Benzilic, Favorskii, Claisen and Benzidine rearrangements. Electrophilic Nucleophilic substitution reactions in aromatic system (Mechanisms of the reactions. Elimination reactions (E1 and E2 mechanism).

CHM 415: CHEMPRENUERSHIP (2 Units)
Rubber products; Hand gloves, foot-mats , oil seal and other vulcanizates. Cosmetic and Detergents; Soaps, Perfumes, Candles, After-Shave, Germicides, Lubricants, Disinfectant. Renewable Products**;** Biodiesel, Bio-Ethanol, Bio-Glycerol, Biogas (from Waste), Silica (from Saw dust and maize Cob). And other locally-made industrial materials .

CHM 421: ORGANIC SYNTHESIS (2 Units)
Critical review of important reactions and synthetic reagents. Some synthetic methods including the mechanisms. Application of important and complex organic compounds.

CHM 422: HETEROCYCLIC CHEMISTRY (2 Units)
The synthetic and mechanistic aspects of fused heterocyclic systems particularly Quinolines, isoquinolines, Benzofurans, Benzothiophenes, indoles, Benzopyrilium salts coumarins and chromones. Application of heterocyclic system in drug syntnesis, particularly 5 & 6 numbered ring.

CHM 423: PHOTOCHEMISTRY AND PERICYCLIC REACTION (2 Units)
Interaction of radiation with matter, electronic excitation, selection rules derivation routes, sensitization, quenching, photofragmentation oxidation, reduction, re-arrangement Adsorption and absorption. Pericyclic reactions – molecular orbital symmetry.

CHM 424: ORGANOMETALLIC CHEMISTRY (2 Units)
Types of organometallic compounds and nature of their bond types: Metal carbonyls and carbonyl halides, metal nitrosyls, e.t.c. preparation, reactions and application of such compounds.

CHM 425: PHYSICAL ORGANIC CHEMISTRY (2 Units)
Preparation and reaction of Stereoisomers: Stereoselectivity, Neighbouring group effects and a few special topics in Physical organic Chemistry.

CHM 426: NON-AQUEOUS SOLVENTS (2 Units)
Classification and General Characteristics, solute-solvent interaction. Protonic solvents. Oxyhalide solvents. Liquid halides. Divitrogen tetroxide, sulphur dioxide. Leveling effects, non-aqueous titrations.

CHM 431: REACTION KINETICS (2 Units)
Review of first, second and third order rate equations. Rate constants and equilibrium

constant. Coillision theory, transition state theory, reaction coordinates. Unimolecular reaction theory; bimolecular reaction mechanism. Chain reaction mechanisms; and photochemical reaction mechanisms. Catalysis and Heterogenous reaction.

CHM 432: ADVANCED ELECTROCHEMISTRY (2 Units)
Electrical double layer, potential at zero charge, polarizable and non-polarizable interarace, mass transport, concentration polarization. Ficks' laws, Levic equation, Electrodics. Polarography.

CHM 433: RADIONUCLEAR CHEMISTRY (2 Units)
Radiochemical methods. Natural radioactivity, fusion, fission, decay processes, nature of radiation. Nuclear models, energies of nuclear reactions. Principles and measurement of radioactivity. Applications of radioactivity. Radiation hazards.

CHM 437: SURFACE AND COLLOIDAL CHEMISTRY (2 Units)
Lyophobic/hydrophilic and Lyophilic/hydrophobis colloids, polydispersity. Size, shape and behaviours of the various colloidal systems. Stability of colloidal dispersion, colloidal electrolytes, polyelectrolytes. Adsorption theories. Surface active agents. Adsorption on solid surfaces. Determination of surface area and porosity.

CHM 441: QUANTUM CHEMISTRY (2 Units)
Postulates of quantum mechanics, operators angular momentum. Solution of the hydrogen atom problem. Theory of atomic spectra, self consistent field theory computational aspects, perturbation of vibration methods.

CHM 443: NATURAL PRODUCTS CHEMISTRY (2 Units)
Terpenoids, Carotenoids, Steroids and Alkaloids. Pericyclic reaction – Molecular orbital symmetry.

CHM 491: ADVANCED EXPERIMENTAL CHEMISTRY (1 Unit)
Basic chemical experiments needed in the laboratory and industry. Experiments to be conducted in all available areas of chemistry viz: analytical, industrial, organic, inorganic, physical, environmental and nanotechnology

CHM 498: SEMINAR (2 Units)
CHM 499: PROJECT (4 Units)

DEPARTMENT OF COMPUTER SCIENCE

INTRODUCTION

The Department of computer was an arm of the then mathematical sciences department established in 1988 at the inception of Federal University of Agriculture, Abeokuta. During the 2005/2006 Session, the Department of computer science evolved to become a unique academic division in the production of highly trained graduates and postgraduates in the field of Computer Science and Information Technology.

Staffs members of the Department are fore front in the recent areas of computer research work. This has enabled her to produce quality graduates who are now occupying various positions in public and private organizations.

PHILOSOPHY AND OBJECTIVES

The programme is designed to give students the opportunity to obtain a broad knowledge in both theory and practice of Computer Science. Students are trained to write programs for solving different real life problems. Such training will lead to the production of skill manpower that is adequately furnished with the current and comprehensive knowledge of Computer Science as well as Information and Communication Technology.

The objectives of the B.Sc. degree in Computer Science are to

- stimulates sustained interest and enthusiasm in Computer Science and its applications the students
- trains students the necessary computing knowledge and skills required to provide effective and timeless computing service to industries, banking and other sectors.
- produce professionally trained and skilled manpower that would be able to develop internationally acceptable software applications.
- provides students with basic network and hardware knowledge needed for modern day practice in information and communication technology.
- trains students with a solid foundation in computer science and knowledge that are required for post graduate studies and research ; and
- inculcate in the students the culture of focused and continuos skills required for carrying out research work in any field of computer science

Academic Staff

NAME	QUALIFICATION	SPECIALIZATION	DESIGNATION
Saidat A. Onashoga	NCE, B. Sc., M. Sc., Ph.D. Abeokuta	Information Security, Data Mining and Algorithmic Engneering	Reader and Ag. HOD
A. T. Akinwale	B.Sc., M.Sc.Ph.D. (Poland)	Artificial Intelligence, Database Systems and Discrete Computing	Professor
O. Folorunso	B.Sc. (Abeokuta), M.Sc. (Lagos), Ph.D.(Abeokuta)	Intelligent Information Systems and Software Engneering	Professor
A. S. Sodiya	B.Sc. (Ogun), M.Sc. (Lagos) Ph.D. (Abeokuta)	Computer Network Security and Software Engneering	Professor
O. A. Ojesanmi	OND. (Ibadan), B.Sc. (Ibadan), M.Sc., Ph.D. (Ife)	Networking / Mobile Computing	Reader
Oluwasefunmi T. Arogundade	B.Sc. (Ondo), M.Sc. (Abeokuta), Ph.D.(China)	Software Engineering, Security Modeling and Human Computer intereaction	Senior Lecturer
Olufunke R. Vincent	NCE, B.Sc., M.Sc., Ph.D. (Abeokuta)	Business Intelligence Systems, Image Processing and Information Engineering	Senior Lecturer
F. T. Ibharalu	B.Sc. (Benin), M.Sc.(Lagos), Ph.D. (Abeokuta)	Mobile Agent Technology and Software Engineering	Senior Lecturer
A. Abayomi-Alli	B.Tech. (Ogbomosho), M.Sc. Ibadan), Ph.D(Ogbomoso)	Pattern Recognition Machie Learning and Statistical Computing	Senior Lecturer
D. O. Aborisade	B.Sc. (Abeokuta), M.Sc. (Ibadan), Ph.D. (Aboekuta)	Cloud and Cloud Database Security, Digital Forensic	Lecturer I
Oluwafolake E. Ojo	B.Sc. (Ogun), M.Sc.(Ife),	Multimedia Networking Modelling and Simulation	Lecturer II
O. S. Salako	B.Sc. (Abeokuta), M.Sc.(UK)	Creative Software Systms, Visual System	Lecturer II
Carolyn O. Tinubu	B.Sc. (Abeokuta), M.Sc.(Lagos),	Database Management Systems and Security	Lecturer II
Alaba O. Adejimi	NCE, B.Sc., M.Sc. (Abeokuta)	Computer Security	Assistant Lecturer

100 Level: First Semester

Course Code	Course Title	U	L	T	P
CSC 101	Introduction to Computer Science	3	2	-	1
MTS 101	Algebra	3	2	1	-
MTS 103	Vectors and Geometry	2	2	-	-
BIO 101	General Biology I	2	2	-	-
BIO 103	Introduction to Physiology	2	2	-	-
BIO 191	Biology Practical	1	-	-	1
CHM 101	Physical Chemistry I	3	2	1	-
CHM 191	Practical Chemistry I	1	-	-	1
PHS 101	General Physics I	3	2	1	-
PHS 191	Physical Laboratory I	1	-	-	1
GNS 101	Use of English	2	2	-	-
GNS 111	Introduction to Social Problems	1	1	-	-
	TOTAL	**24**	**17**	**3**	**4**

100 Level: Second Semester

Course Code	Course Title	U	L	T	P
CSC 102	Introduction to Algorithm Techniques	2	2	-	-
MTS 102	Calculus and Trigonometry	3	2	1	-
MTS 104	Introductory Mechanics	3	2	1	-
BIO 102	General Biology II	2	2	-	-
BIO 192	Practical Biology II	1	-	-	1
CHM 102	Introductory Organic Chemistry	2	2	-	-
CHM 104	Introductory Inorganic Chemistry	2	2	-	-
CHM 192	Practical Chemistry II	1	-	-	1
PHS 102	General Physics II	3	2	1	-
PHS 192	Physics Laboratory II	1	-	-	1
AEM 102	Principles of Economics	2	2	-	-
GNS 102	Introduction to Nigerian History	1	1	-	-
	TOTAL	**23**	**17**	**3**	**3**

200 Level: First Semester

Course Code	Course Title	U	L	T	P
CSC 203	Computer Programming I	3	2	-	1
CSC 205	Discrete Computation	3	2	1	-
CSC 217	Data Structures and Algorithms	3	2	-	1
CSC 209	Computer Hardware and Digital Logic	3	2	-	1
CSC 271	Numerical Computation	3	2	1	-
MTS 213	Linear Algebra I	2	2	-	-
MTS 241	Mathematical Methods I	3	2	1	-
STS 211	Probability II	3	3	-	-
	TOTAL	**23**	**17**	**3**	**3**
*CSC 201	Introduction to Computer Science (for Sciences, Engineering and Non-Agricultural Major)	3	2	-	1
*CSC 221	Computer Science for Agricultural (Students on B. Agric. Programme)	2	2	-	-

**Courses for Non-major Students*

200 Level: Second Semester

Course Code	Course Title	U	L	T	P
CSC 214	System Analysis and Design	3	2	-	1
CSC 204	Computer Programming II	3	2	-	1
CSC 206	Theory of Computation	2	2	-	-
CSC 218	Foundations of Sequential Programming	3	2	-	1
MTS 212	Linear Algebra I I	2	2	-	-
MTS 232	Ordinary Differential Equations	3	2	-	1
ETS 206	Entrepreneurial Studies I	2	2	-	-
GNS 201	Writing and Literary Appreciation	2	2	-	-
GNS 203	Use of Library	1	1	-	-
GNS 202	Elements of Politics & Government	1	1	-	-
GNS 204	Logic & History of Science	2	2	-	-
	TOTAL	**24**	**20**	**-**	**4**

300 Level: First Semester

Course Code	Course Title	U	L	T	P
CSC 301	Structured Programming	3	2	-	1
CSC 337	Computer Architecture & Organization	3	2	-	1
CSC 305	Algorithms and Complexity Analysis	3	2	1	-
CSC 307	Compiling Techniques	3	2	1	-
CSC 309	Information Technology Management	2	2	-	-
CSC 311	Software Engineering	4	3	-	1
CSC 319	Operating System	3	2	-	1
CSC 335	Operation Research	3	2	1	-
	TOTAL	**24**	**17**	**3**	**4**

300 Level: Second Semester

Course Code	Course Title	U	L	T	P
CSC 392	Industrial Training/ Field Work	4			4
CSC 394	Inspection/Visitation	4			4
CSC 396	SIWES Report	4			4
CSC 398	Seminar	4			4
	TOTAL	**16**	**-**	**-**	**16**

400 Level: First Semester

Course Code	Course Title	U	L	T	P
CSC 447	Organization of Programming Language	3	2	-	1
CSC 403	Object Oriented Programming	3	2	-	1
CSC 405	Formal Methods & Software Development	3	2	-	1
CSC 407	Database System	3	2	-	1
CSC 409	Artificial Intelligence	3	2	-	1
CSC 491	Seminar I	1	1	-	-
PHS 443	Electronics	3	2	1	-
	ELECTIVES	4	4	-	-
	TOTAL	**23**	**17**	**1**	**5**
ELECTIVES					
CSC 437	Information and Communication Theory	2	2	-	-
CSC 435	Special Topics in Computer Science	2	-	-	2
CSC 431	Logic Programming	2	1	-	1
CSC 439	Computer System Performance Evaluation	3	2	-	1
CSC 425	Computer Graphics	3	2	-	1
CSC 441	Queuing System	3	2	-	1

400 Level: Second Semester

Course Code	Course Title	U	L	T	P
CSC 402	Network Programming	3	2	-	1
CSC 404	Net-Centric and Web Programming	3	2	-	1
CSC 406	Computer Networks & Data Communication	3	2	1	-
CSC 408	Entrepreneur for Computer Science	2	1	-	1
CSC 410	Human-Computer Interaction	2	2	-	-
CSC 492	Seminar II	1	1	-	-
CSC 499	Project	4	-	-	4
	Electives	4	3	1	-
	TOTAL	**22**	**13**	**2**	**7**
Electives					
CSC 412	Modeling and Simulation	3	2	-	1
CSC 414	Information Technology Law & Ethics	1	1	-	-
CSC 416	Computer Security & Cryptography	2	2	-	-
CSC 418	Distributed Computing Systems	3	2	-	1
CSC 420	Statistical Computing & Data Mining	2	1	-	1
CSC 438	Project Management	3	2	-	1
ELE 503	Digital Signal Processing	3	2	1	-

COURSES SYNOPSES

CSC 101: INTRODUCTION TO COMPUTER SCIENCE (3 Units)

History of computer science and their generations. Origin of computing machines. Computer Hardware: functional components, modern input/output units. Software: System Software, Operating Systems and Utilities, Application Software. Data Storage and Internal representation of data, bits and character representation, concept of data, data compression, record file, basic models of files processing and their

advantages.

CSC 102: INTRODUCTION TO ALGORITHM TECHNIQUES (2 Units)

Problem Solving Strategies, concept and role of algorithm in problem solving process, implementation strategies, concepts and properties of algorithm. The science of algorithm and concept of abstraction.Algorithm representation and discovery, iterative and recursive structures. Algorithmic Tools: Pseudo ode, Flowcharts. Efficiency and Correctness. Students should be introduced to a programming language e.g. Pascal, Delphi etc.

CSC 201: INTRODUCTION TO COMPUTER SCIENCE (3 Units)
(For Sciences, Engineering and Non-Agricultural Major)

Definition of computers and computing system, historical background, generations and characteristics of Computer. Basic functional components of computing system, classification of Computers hardware and software, computer hardware: functional components, modern input/output units. Software: system software, operating systems and utilities, application software: areas of application of computers. Data storage and internal representation of data, bits and character representation concept of data, data compression, records file, basic models of files processing and their advantages. Problem solving Strategies, concept and role of algorithm in problem solving process, implementation strategies, concepts and properties of algorithm, the science of algorithm and concept of abstraction, Algorithm representation and discovery, iterative and recursive structures. Algorithmic tools, pseudocode, flowcharts, introduction to efficiency and correctness of algorithms, introduction to computer programming with emphasis on C or C++. Practical: students are to have hands on practical experience in the Computer Laboratory and are expected to gain a high level of proficiency in problem solving with computers and computer programming.

CSC 203: COMPUTER PROGRAMMING I (3 Units)

Introduction to Problem solving methods and algorithm development, designing, coding, debugging and documenting programmes using techniques of a good programming language style, programming language and programming algorithm development. Principles of Good Programming. Programming Language Elements. A widely used programming language should be used in teaching the above. E.g. C,

CSC 204: COMPUTER PROGRAMMING II (3 Units)

Principle of good programming, structured programming concepts, Debugging and testing, string processing, internal searching and sorting, recursion. Use a programming language different from that in CSC 203. E.g. C++, Python… **Pre-requisite:CSC 102**

CSC 205: DISCRETE COMPUTATION (3Units)

Basic Set Theory: Basic definition, 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 med m, Path matrices. Adjacency Vector/Matrices.Path adjacency matrix, Numerical & Boolean Adjacency matrices. Applications to counting, Discrete Probability Generating function: **Pre-requisite: MTS 101**

CSC209: COMPUTER HARDWARE AND DIGITAL LOGIC (3 Units)

Computer circuits, diode arrays, PIAs etc, integrated circuits fabrication process use of MSI, lSI and VLSI IC' hardware design. Register transfer notation, memory, bus and CPU (datapath and control unit) design. Memory system, general characteristic of memory operation (technology-magnetic recording semi-conductor memory, coupled devices, magnetic bubble).Memory addressing, memory hierarchy, virtual memory and control systems. Hardware control, micro programmed control, asynchronous control, I/C control. Introduction to the methodology of faulty tolerance computing.

Analog computers.Fundamental building blocks, logic expressive immunization, sum of products forms, register transfer notation, physical considerations. Data representation, and number bases, fixed and floating Logic point systems, representation memory systems organization and architecture.

CSC 214: SYSTEM ANALYSIS AND DESIGN (3 Units)

System concept, organization of a Data Processing department, Feasibility study: project identification and selection fact-finding and analysis; process of system design, design problem identification, definitions and solutions, physical and implementation, data capture, data recording transmission, conversion and possible effect, file design control and security, personnel training, system testing and maintenance, evaluation process, system documentation, report writing and presentation.

CSC 217: DATA STRUCTURES AND ALGORITHMS (3 Units)

Primitive types, Arrays, Records Strings and string processing, Data representation in memory, Stack and Heap allocation, Queues, TREES. Implementation Strategies for stack, Queues, trees. Run time storage management, pointers, reference and linked structures.

CSC218: FOUNDATIONS OF SEQUENTIAL PROGRAMMING (3 Units)

The relationship 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 221: COMPUTER SCIENCE FOR AGRICULTURAL STUDENTS (2 Units)

(For B.Agric Students with one Year Farm Practical)

Computer Hardware: History, classifications, configurations, input devices and output devices. Computer Software: operating systems (DOS, MS windows, Linux etc). Software package (Word Processing, spreadsheet, database, graphics and statistical packages). Problem Solving Strategies, concept, properties and role of algorithm in problem solving process, Algorithmic tools: Pseudocode, flowcharts, introduction to programming. Introduction systems, decision support systems, geographic information systems, precision farming and mapping, agricultural information dissemination tool.

Practical: Students are to have hands on practical experience in the Computer Laboratory and are expected to gain a high level of proficiency in computer usage.

CSC 246: THEORY OF COMPUTATION (2 Units)

Formal grammars and automata; meaning of alphabet, string, concatenation, language and level of language; regular expression, regular grammar and context-free languages, deterministic and non-deterministic parsing of context free languages; recursive language, finite state automata, turing machine, pumping lemma, chomsk normal form and CYK algorithm. **Pre-requisites MTS 101**

CSC 271:NUMERICAL COMPUTATION (3 Units)

Approximation, significant figures, Errors; Truncation, Round-off, Recursive Computation (e.g. Herner's method and synthetic division for polynomials), polynomials and their zeroes (for at most degree 4). Bisection rule, Newton-Raphson rule, computations of functions and series.Numerical differentiation, Solution of ordinary differential equations, Direct and iterative methods for solution of linear system, Least square polynomial approximations. Introduction of numerical solution of partial differential equations. Students will be expected to prepare flow charts, write programs analyst, C, C++ in JAVAto compute the above.

Pre-requisite: **MTS 101 OR MTS 102**

CSC 301: STRUCTURED PROGRAMMING (3 Units)

Structured programming elements, structured design principles, abstraction modularity, stepwise refinement, structured design techniques. Teachingof a particular structured programming languagese.g. CH, Python, PASCAL, ALGOL etc.**Pre-requisite: CSC 203 or 204.**

CSC305: ALGORITHM AND COMPLEXITY ANALYSIS (3 Units)

Basic algorithm analysis: asymptotic analysis of upper and average complexity bounds; standard complexity classes time and space tradeoffs in algorithm analysis, recursive

algorithm.
Algorithm strategies: Fundamental computing algorithms: numerical algorithms, sequential and binary search algorithms; sorting algorithms, binary search trees, hash tables, graphs and its representation. **Pre-requisite:CSC 217.**

CSC 307: COMPILING TECHNIQUES (3 Units)
Review of compilers, assemblers and interpreters, structure and functional aspects of a typical compiler, syntax, semantics and pragmatics, functional relationship btw lexical analysis, expression analysis and code generation. Internal form of course programme. Use of a standard compiler, as a working example. Error detection and recovery. Grammars and languages, the parsing problem and the scanner. **Pre-requisite:CSC 206**

CSC 309: INFORMATION TECHNOLOGY MANAGEMENT (2 Units)
Concept and principles of Management, Functions of management. Information Technology Management. Challenges of Management. Technology assimilation. Information technology's strategies, IT policy and strategy, IT planning and strategic issues for senior executives. Developing the firm's IT strategy. IT controls and asset protection, Chief Information Officer duties and responsibilities. Team management, project management tools, software risk and quality assurance

CSC 311: SOFTWARE ENGINEERING (4 Units)
Software Design: Software architecture, Design Patterns, O.O analysis and 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 modeling, Tools, Testing tools, Tools Integrating mechanisms.

CSC 319: OPERATING SYSTEM (3 Units)
Overview of O/S, Role & Purpose, Functionality Mechanism to Support client-server, models, hand-held devices, Design issues influence of security, networking, multimedia, Windows, O/S Principles, Structuring methods, Abstraction processes,, concept of APIS, device organization, interrupts. Concurrency: state and state diagram structures, dispatching and context switching; interrupt; concurrent execution'; mutual exclusion problem and some solutions deadlock; models and mechanisms (semaphores, monitors etc). Producer-consumers problems and synchronizations.Multiprocessor issues, Scheduling and dispatching. Memory management: overlays, swapping and partitions , paging and segmentation placement and replacement policies, working set and trashing, caching.

CSC 335: OPERATION RESEARCH (3 Units)
Phases of Operation Research study and modeling. linear programming, dynamic

programming and integer linear programming, applications of linear and integer programming models in information systems, network models, inventory models, and queuing models, Decision theory and games, flow project controls etc.

CSC 337: COMPUTER ARCHITECTURE AND ORGANIZATION (3 Units)
Register transfer notation, memory, bus and CPU (datapath and control unit) design. Memory system, general characteristic of memory operation (technology-magnetic recording semi-conductor memory, coupled devices, magnetic bubble).Memory addressing, memory hierarchy, virtual memory and control systems. Memory systems organization and architecture, Primary and secondary memories, core memory etc. magnetic devices disks, tapes video disks etc. Hardware control, micro programmed control, asynchronous control, I/C control. Peripheral devices, printers crt's keyboards character recognition, operational amplifiers analog-to –digital and digital-to-analog converter. Introduction to the methodology of faulty tolerance computing.

CSC 392: INDUSTRIAL TRAINING/FIELD WORK (4 Units)
Every student in the Department of Computer Science must undergo an Industrial Attachment in a place relevant to the student's area of interest during the second semester of third year and long vacation of the penultimate year. Assessment of Log Books on six months industrial training activities in Information Technology industries and allied establishments.

CSC 394: INSPECTION AND VISITATION (4 Units)
Assessment of students in their respective industrial training locations.

CSC 396: SIWES REPORTS (4 Units)
Report of the acquired experience will be typed, bounded, submitted and presented. Assessment of this scientific writing of industrial training report.

CSC 398: SEMINAR (4 Units)
Final seminar on topics related to industrial experiences.

CSC 403: OBJECT ORIENTED PROGRAMMING (3 Units)
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. **Pre-requisite: CSC 203 or 204**

CSC 405: FORMAL METHODS AND SOFTWARE DEVELOPMENT (3 Units)

Topics from process improvement, Software re-engineering configuration management, formal specification, formal verification and validation, Software cost-estimation, Software architecture, Software patterns, Software re-use and open-source development. **Pre-requisite: CSC 311**

CSC 407: DATABASE SYSTEMS (3 Units)

DBMS architecture and administration, centralized and client-server approaches, system catalog, and data dictionary, transaction management; concepts, characteristics, and processing, recovery techniques, concurrency control techniques: serializability, deadlock, locking schemes, time-stamp ordering, multi-version, and optimistic techniques, DB security, distributed databases, distributed DBMS, data fragmentation and replication, distributed transactions management, object-oriented databases, introducing to new emerging DB technologies and applications; Web DBs, multimedia DBs, data warehousing and data Mining.

Characteristics and advantages of the database management systems (DBMS), database concepts and architecture; data models, database schemes and instances, DBMS and the concept of program-data independence, database languages and interfaces, database models, relational data model and relational algebra, relational model constraints; domains, keys, and integrity constraints, the structured query language (SQL); data definition, queries, update, statements, and views in SQL, database design; functional dependencies, normal forms. Introduction to OO databases.Information storage and retrieval, information management applications, information capture and representation, analysis and indexing, search, retrieval, information privacy; integrity, security, scalability, efficiency and effectiveness.

CSC 412: MODELLING AND SIMULATION (3 Units)

Foundations of model-based information systems management, basic concepts and techniques of simulation modeling, simulation as decision-support tool and a problem-solving approach. Emphasis will be on discrete-event simulation model development methodologies and implementation techniques. The concepts and techniques used in modeling and simulation, simulation methodology and suitable simulation language Modeling generation of random variables, transformation of random numbers, parameter estimation, design of experiment; factorial design, optimization.Distribution theory model and simulation. Kendal notation, Little's Law, Stochastic Processes, Queues and special types of queues, Discrete state and continuous state processes, Markov Processes, Poisson Processes.

CSC 414: INFORMATION TECHNOLOGY LAW AND ETHICS (1 Unit)

Proliferation of Computers in our World; Computers and the Business World; Medicine and Computers; Computers and Education; Computers and the e-

Government; Computers and the Law; Privacy versus Freedom of Information; Ethics and Professionalism; Intellectual Property Rights.

CSC 416: COMPUTER SECURITY AND CRYPTOGRAPHY (2 Units)

Fundamentals of computer and network security, systems and protocols for providing security services, access control, secure mail, internet protocol security, secured http, web security. Counter measures: cryptography (public and private key encryption), intrusion detection, firewalls, access control, counter cyber-terrorism. Number system, encryption, decryption, private and public key, divisibility and Euclidean algorithms, arithmetic of congruence and large prime numbers, hash function, RSA, DSA, Rabin, El-Gamel, Secure Socket layer algorithms. Security fundamentals, policies, procedures, and mechanisms. Identification, authentication models, access control models. Data models, concepts and mechanisms for software, hardware, operating system and database security. Basic cryptography (symmetric and asymmetric) and its applications. Security in computer networks and distributed systems. Attacks types and how to prevent them. Prevention and control of viruses and other rogue programs. In addition, the basics of physical security, incidence response, disaster recovery, business continuity, and forensics.

CSC 418: DISTRIBUTED COMPUTING SYSTEM (3 Units)

Introduction, definition, motivation, communication mechanisms, distributed transactions, Naming, generic schemes, DNS, naming and localization, Replication and coherence, Consistency models and protocols, fault tolerance, Group protocols, RPC, RMI, Stream oriented communication, synchronization, global state, election, distributed mutual exclusion, communication, two and three phase commit, check pointing, security, access control, key management, cryptography, distributed file system NFS, coda e.t.c.

CSC 420: STATISTICAL COMPUTING & DATA MINING (2 Units)

This course offers an introduction to data mining concepts and techniques. The goal is for the students to have a solid foundation in data mining that allows them to apply data mining techniques to real-world problems and to conduct research and development in new data mining methods. Topics include data mining concepts and techniques, data preparation, data mining algorithms and methods including association analysis, classification, cluster analysis, Online Analytical Processing (OLAP) and dimensionality modeling as well as emerging applications and trends in data mining.

CSC 429: SPECIAL TOPICS IN SOFTWARE ENGINEERING

CSC 431: LOGIC PROGRAMMING (2 Units)

Introduction to functional programming language, first order logic: terms, predicate,

clauses, relations and algorithm. Robinson's substitution, property of substitution, occur problem. K-Clark theory, SLD, resolution (Selection rule-driven, Linear resolution for Definite classes), property of SLD, infinite SLD tree, rules of Close World Assumption (CWA). Application programming with emphasis on PROLOG.

CSC 433 COMPUTER GRAPHICS (3 Units)

Hardware aspect: Plotters, microfilm, display, graphic tables, light pens, other graphical inputs aids. Fascimile and its problems. Refresh display, refresh buggers, changing images, light pen interaction. Two and three dimensional transformations, perspective. Clipping algorithms, Arnock's method, shading, data reduction for graphical input. Introduction to character recognition. Curve synthesis and fitting. Contouring ring structures versus doubly linked lists. Hierarchical structures data structure, organization for inter-active graphics

CSC 435: SPECIAL TOPICS IN COMPUTER SCIENCE (2 Units)

In depth study of selected topics will be taught in a seminar format. Research methods; choosing and evaluating references; collecting data; analyzing data; critical evaluation of research; report writing skills; presentation skills. Selected topics would be given to the students at the commencement of the semester.

CSC 437: INFORMATION AND COMMUNICATION THEORY (2 Units)

Historical background of information theory, the entropy function and its properties, joint and conditional entropy, discrete memory-less channels, models for communication systems, classification of channels, channel capacity, decoding schemes, the fundamental theorem and its weak converse, finite state channels, continuous channels, entry in the continuous case

CSC 438 PROJECT MANAGEMENT (3 Units)

Team Management, Project Scheduling, Software measurement and estimation techniques, Risk analysis, Software quality assurance, Software Configuration Management, Project Management tools.

CSC 439: COMPUTER SYSTEM PERFORMANCE EVALUATION (3 Units)

Measurement techniques, Simulation techniques, Techniques, Work load characterization, Performance evaluation in selection problems, Performance evaluation in design problems, Evaluation of program performance.

CSC 440: HUMAN-COMPUTER INTERACTION (2 Units)

Introduction to the field of Human-Computer Interaction (HCI) and an overview of software architectures used in modern graphical user interfaces. A variety of analysis and design methods are introduced (e.g. GOMS. heuristic evaluation, User-Centred

Design and contextual design techniques). Interface implementation with the Java Swing toolkit. Evaluations of user interfaces according to usability and accessibility standards will be covered. Quality of design, user-centered approach to interface development is emphasized. Relevant of HCI is also central to recent technological developments such as hypertext, multimedia,virtual reality and the web. Psychological aspects of the individual user, universal design principles, and User Centered Design (UCD) models.Interactive system development lifecycle and its requirements, major themes and recent trends in HCI, interaction design models, participatory design, Information Architecture (IA), adaptive interfaces, measuring the User Experience (UX), social computing and online communities, mobile computing and issues surrounding the design for smaller screens, ubiquitous computing, Computer Mediated Communication (CMC) and Computer Supported Cooperative Work (CSCW).

CSC441: QUEUEING SYSTEM (3 Units)

Introduction; Birth-death queuing systems; Markovian queues, the queue M/GI bounds, inequalities and approximations.

CSC 442: NETWORK PROGRAMMING (3 Units)

Client server model and software design program interface to protocols. File Descriptor, Socket Descriptor, Datagram Socket, Data Encapsulation, System Burst (bind, connect, listen, accept, send/to, send/from). Remote call procedures, port addressing protocols.Implementing client-server using IP, TCP and UDP protocols. Distributed program generation

CSC 443: ARTIFICIAL INTELLIGENCE (3 Units)

Introduction to Artificial Intelligence, Understanding natural languages, Knowledge representation, Expert systems, Pattern recognition, The Language LISP, Machine Learning, Artificial Neural Network, Genetic Algorithm, Fuzzy Set Theory and Fuzzy Logic.

CSC 444: NET-CENTRIC COMPUTING & WEB PROGRAMMING (2 Units)

Advanced and modern concepts and technologies used in the development of electronic business applications. Component development and reuse, distributed object technologies, multi-tier applications, client-side versus server-side technologies, service-oriented architectures, enterprise application integration, data transformation, role of open-source technologies, and finally e-business application installation and deployment issues. Principles of distributed computing, the Internet as a huge computer system, distributed computing models: client-server model, multiple-server model, mobile agents model, and computer networks, TCP applications, IP layer applications, socket management, inter-process

communication, UNIX case study, distributed object oriented architectures; design issues, applications in client-server computing, introduction to distributed file systems, name servers, mobile computing, modern trends in distributed computing.

CSC 446: COMPUTER NETWORKS& DATA COMMUNICATION (3 Units)

Introduction, wares, Fourier analysis, measurement of communication, channel characteristics, Transmission media, noise and distortion, modulation and demodulation, multiplexing, TDM FDM and FCM parallel and serial transmission (synchronous VS anal synchronous). Basic concepts of inter-active computing, un-interactive terminal devices protocol, direct links, communication channels, telecommunication links, simplex, duplex and hard duplex, multiplexer, concentration. Computer network structures and loop systems, computer network examples and design consideration, data switching principle broadcast techniques, network structure for packet switching, protocol, description of networks e.g. ARPANET, etc.Network Operating system for online processing scheduling algorithm, response time, reliability and security.

CSC 447: ORGANIZATION OF PROGRAMMING LANGUAGE (3 Units)

Language definition structure, Data types and structures, Review of basic data types, including list and trees, control structure and data flow, Runtime consideration, interpretative languages, lexical analyses and parsing, evaluation of programming languages.

CSC 448: ENTREPRENEUR FOR COMPUTER SCIENCE (2 UNITS)

Meaning of Technopreneur. Classifications of entrepreneurs in IT. Characteristics of Information Technology Entrepreneur. Small, medium and Large IT Entrepreneur. Characteristics of entrepreneurship in IT and rewards. Management challenges in IT business. IT Business outlook in Nigeria. Comparative analysis of IT business between Third World Countries and Developed Countries. New ideas and opportunities identification, Competitive strategy for Technopreneurs, Intellectual property consideration. Value-based selling. Business plan design.

CSC 491 SEMINAR I (1 unit)

Presentation of topics related to final year project.

CSC 492 SEMINAR II (1 unit)

Presentation of implementation and results' analysis of the final year project

CSC 499 PROJECT (4 Units)

INDEPENDENT RESEARCH WORK IN COMPUTER SCIENCE

Independent research work in Computer Science. Students will give a seminar

presentation from introduction to implementation stage of their research work. Final bound report should be submitted at least two weeks before the final semester examination.

DEPARTMENT OF MATHEMATICS

The Department offers courses in Mathematics at the undergraduate level leading to the award of B.Sc. (Hons) in Mathematics. The Department also offers Postgraduate Programmes leading to the award of M.Sc. and Ph.D. degrees in Mathematics.

The Department will operate the following curriculum for its B. Sc. (Hons) Mathematics Programme.

BACHELOR OF SCIENCE IN MATHEMATICS

Philosophy and Objectives

Mathematics is a subject of varied features ranging from intrinsic beauty to its usefulness with wide-scope of applications in Science, Engineering, Technology and Social Sciences. This Mathematics programme is designed for students who are interested in these features. The curriculum has been carefully planned to equip students with a broad knowledge from various aspects of Mathematics.

The curriculum has been carefully planned to assist the students to specialize according to their own aptitude in Pure Mathematics or in any area of Applied Mathematics.

The main goals of the programme are:

1) To train professional Mathematicians to reason rigorously and logically, as well as to be objective and analytical. This can easily make our graduates branch out to be successful in business, system analysis or financial sector.
2) To train Mathematicians to pursue the study of scientific and technological problems by mathematical techniques and to undertake research in various branches of mathematics.
3) To give instructions in mathematics to those who require it in some other courses of study in the various departments of the University.
4) To train high - skilled mathematicians who will be able to translate some of the abstract concepts into reality and use same in solving some emerging national problems.
5) To train graduates who are not only qualified in the core subjects but have a good overall ability in the applied mathematics. This will serve them well in many employment fields such as teaching, finance, software development and research.

	3 YEAR PROGRAMME	4 YEAR PROGRAMME
(A) University Compulsory Courses		
(i) General Studies (GNS)	5	10
(ii) Relevant Compulsory Course (PHS 364, ETS 206)	3	3
(iii) 100 Level Courses	-	38
(B) Core Courses		
(i) 200 Level	39	39
(ii) 300 Level	38	38
(iii) 400 Level	21	21
(iv) Industrial Training	16	16
(C) All Electives	15	15
Total	**137**	**180**

Academic Staff

Name	Qualification	Specialization	Designation
S. A. Akinleye	B.Sc. (Maiduguri) M.Sc. (Ibadan), Ph.D. (Abeokuta)	Optimization Neutrosophics and Non Association Algebra	Senior Lecturer and Ag. Head of Department
J. A. Oguntuase	B.Sc. (Ado-Ekiti), M.Sc., Ph.D.(Ife)	Inequalities	Professor
O. J. Adeniran	B.Sc., M.Sc. (Ife), Ph.D.(Abeokuta)	Theory of Loops & Non Associative Algebra	Professor
A. A. A. Agboola	B.Sc., M.Sc. (Lagos), Ph.D. (Abeokuta)	Fuzzy sets and Fuzzy Algebraic Structures	Professor
B. I. Olajuwon	B.Sc. (Ogun), M.Tech., Ph.D. (Ogbomoso)	Fluid Mechanics	Professor
M. O. Omeike	B.Sc., M.Sc. (Ibadan), Ph.D.(Abeokuta)	Differential Equations	Professor
I. A. Osinuga	B.Sc. (Ogun),M.Sc.(Ibadan), Ph.D. (Ilorin)	Optimization Theory	Reader
E. O. Adeleke	B.Sc. (Jos), M.Sc. (Ibadan), Ph.D. (Ibadan)	Probability Theory	Lecturer I
E. Ilojide	B.Sc.(Benin), M.Sc., Ph.D.(Ife)	Theory of Loop	Lecturer I
M. T. Raji	B.Sc., M.Sc., Ph.D. (Ilorin)	Numerical Analysis	Lecturer II
O. J. Ogunsola	B.Sc., M.Sc., Ph.D.(Abeokuta)	Banach Algebra	Lecturer II
A. A. Adeyanju	B.Sc.(Abeokuta),M.Sc.(Ibadan)	Differential Equations	Lecturer II
D. O. Adams	B.Sc., M.Sc. (Abeokuta)	Differential Equations	Lecturer II
A. A. Yusuf	B.Sc.(Abeokuta), M.Sc.(Ilorin)	Complex Analysis	Assistant Lecturer
O. O. Oyebola	B.Sc., M.Sc. (Abeokuta)	Algebra	Assistant Lecturer

100 Level: First Semester

Course Code	Course Title	U	L	T	P
MTS 101	Algebra	3	2	1	-
MTS 103	Vector and Geometry	2	2	-	-
PHS 101	General Physics	3	2	1	-
PHS 191	Physics Laboratory I	1	-	-	1
CHM 101	Physical Chemistry I	3	2	1	-
CHM 191	Practical Chemistry I	1	-	-	1
BIO 101	General Biology I	2	2	-	-
CSC 101	Introduction to Computer Science	2	1	-	1
GNS 101	Use of English	2	2	-	-
GNS 111	Introduction to Social Problems	1	1	-	
STS 181	Probability 1	3	3	1	-
MTS 105*	Algebra and Trigonometry	3	2	1	-
	TOTAL	**23**	**16**	**4**	**3**

* For Non-Science Major

100 Level: Second Semester

Course Code	Course Title	U	L	T	P
MTS 102	Calculus and Trigonometry	3	3	1	-
MTS 104	Mechanics	3	2	1	-
PHS 102	General Physics II	3	2	1	-
PHS 192	Physics Laboratory II	1	-	-	1
CHM 104	Introductory Inorganic Chemistry	2	2	-	-
CHM 192	Practical Chemistry II	1	-	-	1
BIO 102	General Biology II	2	2	-	-
CSC 102	Introduction to Algorithm Techniques	2	2	-	-
STS 112	Statistical Inferences	3	2	1	-
STS 192	Laboratory for Statistical Inferences I	1	-	-	1
AEM 102	Principles of Economics	2	2	-	-
GNS 102	Introduction to Nigeria History	1	1	1	1
	TOTAL	**24**	**17**	**4**	**3**
*MTS 106	Calculus for Biological Sciences	3	2	1	-

* For Non-Science Major

200 Level: First Semester

Course Code	Course Title	U	L	T	P
MTS 211	Abstract Algebra I	3	2	1	-
MTS 213	Linear Algebra I	2	2	-	-
MTS 223	Real Analysis I	3	2	1	-
MTS 241	Mathematical Methods I	3	2	1	-
MTS 251	Introduction to Numerical Analysis	3	2	-	1
CSC 203	Computer Programming I	3	2	-	1
STS 231	Probability II	4	2	1	-
	TOTAL	**22**	**14**	**4**	**2**
*MTS 201	Mathematical Foundations	3	2	1	-

* For Non-Science Major

200 Level: Second Semester

Course Code	Course Title	U	L	T	P
MTS 202	Vectors Analysis	**2**	**2**	-	-
MTS 216	Linear Algebra II	**2**	**2**	-	-
MTS 214	Complex Analysis I	**3**	**2**	**1**	-
GNS 201	Writing and literacy Appreciation	**1**	**1**	-	-
GNS 203	Use of Library	**1**	**1**	-	-
GNS 202	Elements of Politics & Government	**1**	**1**	-	-
GNS 204	Logic and History of Science	**2**	**2**	-	-
PHS 364	Energy and Environment	**1**	**1**	-	-
ETS 206	Entrepreneurship Studies & Change Mgt.	**2**	**2**	-	-
CSC 206	Data Structures & Algorithms	**2**	**2**	-	-
	TOTAL	**17**	**16**	**1**	-

300 Level: First Semester

Course Code	Course Title	U	L	T	P
MTS 311	Groups and Rings	3	2	1	-
MTS 313	Vector and Tensor Analysis	3	2	1	-
MTS 315	Ordinary Differential Equations II	3	2	1	-
MTS 323	Real Analysis II	3	2	1	-
MTS 341	Mathematical Methods II	3	2	1	-
MTS 351	Numerical Analysis II	3	2	1	-
MTS 361	Metric Spaces	3	2	1	-
MTS 363	Introduction to Operations Research	3	2	1	-
	Elective	3	2	1	-
	TOTAL	**27**	**18**	**9**	-
Electives					
STS 371	Statistical Quality Control	3	2	-	1
CSC 303	Assembly Language Programming	3	2	1	-
MTS 365	Analytical Dynamics	3	2	-	1
PHS 321	Statistical and Thermal Physics	3	2	1	-

300 Level: Second Semester

Course Code	Course Title	U	L	T	P
MTS 392	Training Assessment	4	-	-	4
MTS 394	Visitation	4	-	-	4
MTS 396	Industrial Training Report	4	-	-	4
MTS 398	Industrial Training Seminar	4	-	-	4
	TOTAL	**16**	-	-	**16**

400 Level: First Semester

Course Code	Course Title	U	L	T	P
MTS 405	Theory of Ordinary Differential Equation	3	2	1	-
MTS 421	Complex Analysis II	3	2	1	-
MTS 423	Functional Analysis	3	2	1	-
MTS 453	Mathematical Modeling	3	2	1	-
MTS 461	General Topology	3	2	1	-
MTS 463	Field Extension Theory	3	2	1	-
MTS 497	Seminar I	1	-	1	-
	Elective	3	2	1	-
	TOTAL	**22**	**14**	**8**	**-**
Electives (3units)					
MTS 431	Fluid Dynamics I	3	2	1	-
MTS 435	Elasticity I	3	2	1	-
MTS 443	Mathematical Methods III	3	2	1	-
MTS 465	System Theory	3	2	1	-

400 Level: Second Semester

Course Code	Course Title	U	L	T	P
MTS 424	Lebesgue Measure and Theory of Integration	3	2	1	-
MTS 442	Partial Differential Equations	3	2	1	-
MTS 494	Entrepreneurship Studies for Math. Students	2	2	-	-
MTS 498	Seminar II	1	-	1	-
MTS 499	Project	4	-	-	4
	Electives	6	4	2	-
	TOTAL	**19**	**10**	**5**	**4**
Electives (6 units)					
MTS 410	Advanced Algebra	**3**	**2**	**1**	**-**
MTS 432	Fluid Mechanics II	**3**	**2**	**1**	**-**
MTS 436	Elasticity II	**3**	**2**	**1**	**-**
PHS 442	Analytical Mechanics	**3**	**2**	**1**	**-**
MTS 446	Calculus of Variation	**3**	**2**	**1**	**-**

COURSE SYNOPSES

MTS 101: ALGEBRA (3 Units)

Elementary Set Theory: Set notations, terminologies and operations. Algebra of sets. Venn diagrams and applications. Real Numbers: Number systems from Natural to Reals. Operations on Real Numbers, indices, Logarithms and Surds. Mathematical induction. Polynomials and Rational Expressions: Remainder and Factor Theorems, Partial Fractions. Inequalities. Equations in one variable: Theory of quadratic equations, Cubic equations and equations reducible to quadratic type. Simple

simultaneous equations. Sequences and Series: AP and GP. Means, n^{th} term and limits. Binomial Theorem for any index. Binomial series. Matrices (m, n, $\leq$ 3): Notations. Algebra of matrices Determinants. Inverse of matrix and solution of linear system of equations. Complex Numbers: Algebra of complex numbers. Argand diagram. De Moivre's Theorem, and n^{th} roots of unity.

MTS 103: VECTORS AND GEOMETRY (2 Units)

Equations of straight lines, intersecting and perpendicular lines, equations of lines and planes in R^3, conic sections; circle, parabola hyperbola and ellipse. Geometric representation of vectors in R^2 and R^3, components, direction cosines. Addition, scalar, multiplication of vectors, linear independence. Scalar and vector product of two vectors. General equation of a conic in polar coordinates.

MTS 105 ALGEBRA AND TRIGONOMETRY FOR BIOLOGICAL SCIENCES (3 Units)

Use of Mathematics in Agriculture. Elementary Set Theory: Set notations. Set operations. Algebra of sets. Venn diagram. Applications. Operations with Real Numbers: Indices and Logarithms. Surds. Use of Logarithms in Agricultural Sciences. Remainder and Factor theorems. Partial Fractions. Equations and Inequalities: Linear and Quadratic inequalities. Theory of quadratic equations. Cubic Equations. Equations reducible to Quadratic type. Sequences and Series: Arithmetic and Geometric Progression. Arithmetic mean and Geometric mean. Arithmetic Series. Geometric series. n^{th} term of a series. Binomial theorem. The General term. Binomial series. Matrix Algebra: Matrices. Algebra of Matrices. Determinant of a Matrix. Properties. Inverse of a matrix. Solution of Linear system of Equations. Elementary Trigonometry: Degree and Radian Measures. Pythagorean Identities. Trigonometric functions of any Angle. Graphs. Inverse trigonometric functions. Compound Angles. Solution of trigonometric Equations.

MTS 102: CALCULUS AND TRIGONOMETRY (3 Units)

Functions of a real variable and their graphs. Limits, and idea of continuity of functions. Removable discontinuity. Trigonometry: Circular measures and Pythagorean identities. Trigonometric functions of any angles, compound angles. Inverse Trigonometric functions, solution of trigonometric equations. The derivative as limit of rate of change. Techniques of differentiation of elementary functions. Application of derivative to errors and approximation, minima and maxima, curve sketching etc. Integration as inverse of differentiation. Methods of integration. Definite integrals. Applications to areas and volumes etc.

MTS 104: MECHANICS (3 Units)

(The vector approach should be used in what follows). The notions of displacement, speed, velocity and acceleration of a particle. Newton's laws of motion and application to simple problems. Work, power and energy. Application of the principle of conservation of energy to motion particles and those involving elastic

strings and springs. Collision of smooth spheres. Simple problems projectiles. Simple pendulum and simple harmonic motion. Resultant of any number of forces acting on particle. Reduction of coplanar forces. Equilibrium of coplanar forces, parallel forces, couples. Laws of friction. Applications of the principles of moments. Moments of inertial of simple bodies.

MTS 106: CALCULUS FOR BIOLOGICAL SCIENCES (3 Units)

Functions in Agriculture. Domain and Range of a function. Graphs of Elementary functions. One-to-one and Onto Functions. Composite function. Applications to Agricultural Sciences. Limits and Continuity: Limits. Algebra of Limits. Continuity and discontinuity of functions. Removable discontinuity. Differentiation: Geometrical meaning of derivatives. Algebra of differentiable functions. Implicit differentiation. Logarithmic differentiation. Higher derivatives etc. Applications of derivatives: Errors and Approximations. Minima and Maxima. Curve sketching etc. Applications to Agricultural Sciences. Integration as Inverse of Differentiation. Indefinite and Definite Integrals. Properties. Methods of Integration. Applications to area under a curve. Surface Areas and volumes etc. Co-ordinate Geometry: Slope and midpoint of a line. Equations of a straight line. Parallel and perpendicular lines. Equations of a circle, Parabola, Ellipse and hyperbola. Tangents and Normal.

MTS 201: MATHEMATICAL FOUNDATIONS (3 Units)
PRQT, MTS 101 OR MTS 102

Review of integration and its applications to area, volume, centroids and center of mass. Sequence, series, power series and their convergence. Equations of line and circles. Conic sections. First and second order ordinary differential equations. Partial derivatives, total derivatives and applications. Double and multiple integrals. Introduction to vector spaces, linear algebra and metrics. Eigenvalues and eigenvectors and application of metrics to a system of linear equations.

MTS 202: VECTOR ANALYSIS (3 Units)
PRQT MTS 212

Elementary vector algebra. Vector and Triple vector products. Solution of vector equation, plain curves and space curves. Geometrical equation of lines and planes. Linear independence of vectors; components of vectors. Direction cosines; position vector and scalar products; Serret Frenet formulae; differential definition of gradients, divergent and simple calculations.

MTS 211: ABSTRACT ALGEBRA 1I (3 Units)
PRQT MTS 101

Introduction to the language and concepts of modern Mathematics. Topics include: Basic set theory: mappings, relations, equivalence and other relations, Cartesian products. Binary logic, methods of proof. Binary operations. Algebraic structures, semigroups, rings, integral dmains, fields. Homomorphisms. Number systems;

properties of integers, rationals, real and complex numbers.

MTS 213: LINEAR ALGEBRA I (2 Units)
PRQT MTS 101 OR MTS 103
Vector spaces over the real field, subspaces, sum and direct sum of spaces. Linear independence, Basis, and dimension. Linear transformations and matrix representations; range, null space and rank. Singular and non-singular transformations and matrices. Matrix algebra.

MTS 212: LINEAR ALGEBRA II (2 Units)
PRQT MTS 101 OR MTS 103
Triangular matrices. Elementary matrix. Rank and nullity. Determinants. Adjoints, Cofactors, inverse matrix and solution of system of linear equation. Determinant and rank. Cramer's rule. Equivalent and similar matrices. Minimum and characteristic polynomials. Eigenvalues and eigenvectors vectors, bilinear and quadratic forms.

MTS 214: COMPLEX ANALYSIS I (3 Units)
PRQT MTS 223
Function of a complex variable. Limits and continuity of functions of a complex variable, complex integrations, Derivation of Cauchy-Riemann equation. analytic functions. Bilinear transformations, conformal mapping, contour integrals. Cauchy's theorems and its main consequences, convergence of sequences and series of functions of a complex variable. Power series. Taylor series.

MTS 223: REAL ANALYSIS (3 Units)
PRQT MTS 101 OR MTS 103
Sets. Real and complex numbers. Convergence and divergence of sequences and series of complex numbers. Mapping, functions of real variables, continuity and differentiability. Taylor's theorem extensions and applications. Introduction to Reimann integration.

MTS 232: ORDINARY DIFFERENTIAL EQUATIONS (3 Units)
PRQT MTS 102
Derivations of equations from physics, geometry, biology, etc. Techniques for solving first and second order linear and non-linear equations and for solving the n-th order linear equations. Finite differences and difference equations. Interpolation, error, solution of equations, elementary numerical integration.

MTS 241: MATHEMATICAL METHODS I (3 Units)
PRQT MTS 101 OR MTS 102
Real-valued functions of real variable. Review of differentiation and integration and

their applications. Mean value theorem. Taylor's series. Functions of several variables, Jacobian function, dependence and independence, multiple integrals, line integrals, improper integrals .Relations between vector field functions, integral theorems,. Gauss's Stoke's and Green's theorems. Elementary tensor calculus. Fourier and Laplace transforms, convolution properties, linear integral equations.

MTS 251: INTRODUCTION TO NUMERICAL ANALYSIS I (3 Units)
L30 PO T15) PRQT- MTS 101, 103
Solution of algebraic and transcendental equations. Curve fitting. Error analysis. Interpolation and approximation. Zeros of nonlinear equations in one variable. Systems of linear equations. Numerical differentiation and integral equations. Initial value problems for ordinary differential equations.

MTS 311: ABSTRACT ALGEBRA II (3 Units)
PRQT MTS 211
Group: definition, examples including permutation groups. Subgroups, cosets, Lagranges theorem and applications. Cyclic groups. Rings: definition, examples including Z, Zn, rings of polynomials and matrices. Integral domains, fields, polynomial rings, factorization. Euclidean algorithm for polynomilas. H.C.F. and L.C.M of polynomials

MTS 313: VECTOR AND TENSOR ANALYSIS (3 Units)
L30: P0: T15; PQRT- MTS 213, 241
Vector algebra. Vector, dot and cross products. Equation of curves and surfaces. Differentiation of vectors and applications. Gradient, divergence and curl. Vector integration, Lines, surface and volume integrals. Divergence. Theorem, Green's and stoke's theorems. Tensor products of vector spaces. Tensor algebra. Symmetry. Cartesian tensors.

MTS 315: ORDINARY DIFFERENTIAL EQUATIONS II (3 Units)
L30 P0 T15 PRQT: MTS232
Ordinary different equations: linear dependence, Wroskian, reduction order, variation of parameters, series solutions near an ordinary and a regular singular points. Special functions: Gamma, Beta, Bessel, Legendre and hypergeometric equations and functions, Gama and Beta functions. Laplace transforms and applications to initial value problems

MTS 323: REAL ANALYSIS II (3 Units)
PRQT MTS 223
Differentiation derivatives, directional derivatives, partial derivatives and higher order derivatives, Taylor's theorem, inverse function theorem. Implicit function theorem. Extrema and method of language multipliers. Riemann integral, Reimann-

Stieltjes integral functions of bounded variation. Partial integration formula. Mean value theorems. Integration of function of several variables.

MTS 341: MATHEMATICAL METHODS II (3 Units)
PRQT MTS 232, MTS 241
Stum-Liouville problem. Orthogonal polynomial and functions. Fourier series and integrals, partial differential equations: general and particular solutions, Linear equations with constant coefficients, first and second order equations, solution of heat, wave and Laplace equations by the methods of separable variables, eigen function expansions and Fourier transforms.

MTS 351: NUMERICAL ANALYSIS II (3 Units)
PRQT MTS 251
Polynomial and splines approximation. Orthogonal polynomials and Chebysev approximations. Direct and iterative methods for the solution of systems of linear equations. Eigen value problem – power methods, inverse power methods. Pivoting strategies.

MTS 361: METRIC SPACES (3 Units)
PRQT MTS 223
Metric Spaces: Definition and examples, open sets, neighbourhoods, closed sets, interior, exterior, frontier, limit points, closure, dense subset, separable spaces, continuity, compactness and connectedness. Point set topology. The space R^n with Euclidean metric, metric topologies. Equivalent metric. Heine-Borel theorem, Bolzeno – Wierstrass theorem. The Cantor set.

MTS 363: INTRODUCTION TO OPERATIONS RESEARCH (3 Units)
PRQT MTS 223 OR MTS 213
Phases of operations research study, classification of operations research Models: linear; dynamic and integer programming. Decision theory, inventory models, Critical path analysis and project controls.

MTS 365: ANALYTICAL DYNAMICS (3 Units)
L30 P0 T15
Lagrange's equations for non-holonomic systems. Lagrangian multipliers. Variational principles: Calculus of variation, Hamilton's principle. Lagrange' **s** equation from Hamilton's principles. Canonical transformations. Normal modes of vibrations. Hamilton-Jacobi equations

300 LEVEL (SECOND SEMESTER) - INDUSTRIAL ATTACHMENT

MTS 393: TRAINING ASSESMENT (4 Units)

MTS 394: VISITATION (4 Units)

MTS 396: INDUSTRIAL TRAINING REPORT (4 Units)

MTS 398: INDUSTRIAL TRAINING SEMINAR (4 Units)

MTS 405: THEORY OF ORDINARY DIFFERENTIAL EQUATION (3 Units)

Existence and uniqueness theorem, dependence of solution on initial data and parameter. Properties of solutions. Sturm comparison and Senin-Polye theorems. Linear system, Floguet's theory. Non-linear system, stability theory. Integral equations, classification. Fredholm's alternative, method of successive approximations, Neu-man's series, resolvent kernel. Volteral equations. Application to ordinary differential equations.

MTS 410: ADVANCED ALGEBRA (3 Units)

Lattice theory, Neotherian and Artirian modules and rings. Hilbert basis theorem. Chinese or mainder theorem. Semi-simple modules and rings. Prime spectrum of a communicative ring.

MTS 421: COMPLEX ANALYSIS II (3 Units)

L30 P0 T15 PRQT: MTS 214, MTS 223

Laurent expansions, Isolated singularities and residues. Residuce theorem. Calculus of residue, and application to evaluation of integrals and to summation of series. Maximum Modulus principle. Argument principle Rouche's theorem. The fundamental theorem of algebra. Principle of analytic continuation. Multiple valued functions and Riemann surfaces.

MTS 423: FUNCTIONAL ANALYSIS (3 Units)

A survey of the classical theory matrix spaces (including Baire's category theorems compactness, separability, isometrics and completion), elements of Banch and Hilbert spaces, parallelogram law and linear spaces into second dual, and Hongo H, properties of operators (including the open mapping and closed graph theorem), the spaces C(X), the sequences (Banach) spaces $L^n p$, Lp and C (spaces of convergent sequences).

MTS 424: LESBEGUE MEASURE AND THEORY OF INTEGRATION (3 Units)

Lesbegue measure for subsets of R^n. Lesbegue integration of real and complex-valued functions defined on subsets of R^n. General measure space (X,μ,λ) and Lesbegue integration with respect to μ of real and complex-value function on X. The classical

Banach spaces.

MTS 431: FLUID DYNAMICS I (3 Units)

Thermodynamics, compressibility effects, equation of continuity and motion, energy equation, one-dimensional unsteady flow, small disturbance theory, normal and oblique shock waves, flow produced in a tube by moving piston, differential equation satisfied by velocity potential in steady irrotational motion. Linearized form of the equation of subsonic and supersonic flow.

MTS 432: FLUID MECHANICS II (3 Units)

Tensor analysis, stress and strain, Navier Stokes equations, Energy equation, Simple exact solution of Navier Stokes equation, Dynamical similarity, Slow flows, Stokes and Oseen's. Lubricating theory, laminar boundary layer, similar solutions. Laminar boundary layer separation.

MTS 435: ELASTICITY I (3 Units)

Tensor: Introduction to elements of tensor calculus, strain, stress. Finite deformation of elastic solids. Infinesimal theory, Isotopic and non-isotopic elastic media. Solution of simple problems. Elementary concepts of heterogeneous media.

MTS 436: ELASTICITY II (3 Units)

Two-dimensional problems of elasticity, plane strain, plane stress, generalized plane problem. Theory of membranes and torsion problems: bending of flat plates. The airy stress functions and displacement functions. The complex stress function circular boundary.

MTS 442: PARTIAL DIFFERENTIAL EQUATIONS (3 Units)

Theory and solution of first order equations. Second order linear equation, classifications, characteristics, canonial forms, Cauchy problem. Elliltic, Laplace's and Possion equations. Fundamental solutions; Green's functions, Possion's formula, properties of harmonic functions, hyperbolic functions, the wave equation, retarded potential, transmission linear equations. Remain method parabolic equations, Diffusion equation, singularity function. Boundary and initial value problems.

MTS 443: MATHEMATICAL METHODS III (3 Units)

Functional Euler's equations, problems with moving boundaries, extremes with corners, conditional extreme; principles of least action, isoperimetric problems. Hamilton's principle; direct methods of Euler, Rits, Kantorivich, etc. Application to solution of differential equations.

MTS 452: NUMERICAL ANALYSIS III (3 Units)

Difference equations: Notation and definition, formation of difference equations. The

concept of solution of a difference equation. Linear homogeneous difference equation. Approximation of the solution of partial differential equation: classification of partial differential equations, approximation of derivatives by finite differences, simple parabolic differential equations, the explicit form of the difference equation and its convergence, the implicit form of the difference equation and its convergence, stability and consistency, the Crank-Nicholson method, introduction to finite element method, variational formulations, engineer's point of view of finite element methods. Boundary conditions, weighted residual methods, the Galerkin method.

MTS 453: MATHEMATICAL MODELLING I (3 Units)

Introduction and Methodologies. Dimensional analysis, scaling, approximation and reasonableness of answers. Elements of dynamical system. Solutions to linear state equations, controllability and observability. Application to deterministic and stochastic processes, examples from life, physical, biological, social and behavioural sciences. Simple algorithms to handle simple discrete models.

MTS 461: GENERAL TOPOLOGY (3 Units)

Topological spaces: Neighborhoods and neighborhood systems. Subspace induced topology, Bases, sub-bases continuity. Metric and normed spaces. First and second countable, separable spaces, Hausdorff, regular, normal spaces, T_1, T_2, T_3, T_4 spaces, compactness and product spaces. Path. connectedness.

MTS 463: FIELD EXTENSION THEORY (3 Units)

L30: P0: T15; PQRT- MTS 311

Fields, prime-subfields, fields of quotients. Irreducibility; Field extensions, degree of an extension, minimum polynomial. Algebraic and transcendental extensions, finite extensions, algebraically-closed fields. Splitting fields, separable and normal extension. Application to straight edge and compass constructions. Galois fields. Automorphism of fields, F-automorphism.Solvability by radicals. Fundamentals of Galois Theory. Applications.

MTS465: SYSTEMS THEORY (3 Units)

L30 P0 T15

Lyapunov Theorems. Solution of Lyapunov stability equation ATP + PA = Q. Controllability and observability. Theorem on existence of solution of linear systems of differential equations with constant coefficients.

MTS 468: OPTIMIZATION THEORY (3 Units)

Review of linear programming models. The general non-linear programme: direct search and gradient methods, golden search and Fibonacci methods, conjugate gradient methods of Fletcher, Power and Reeves, cutting place methods,

unconstrained optimization, Langrange multipliers method of constrained optimization, convex programming, penalty function methods, sequential unconstrained techniques, Kuhn-Tucker theory, quadratic programming algorithms of Scale and Wolfe, the complimentary problem.

MTS 494: ENTERPRENEURSHIP STUDIES FOR MATHEMATICS STUDENTS (2 Units)
Financial Mathematics: Simple interest, proportions, fractions, rate, inverse proportion, compound interest etc. Percentage error and sets. Theory of differentiation and integration. Curves sketching. Application of derivative to errors and approximation, minima and maxima. Sequence and series. Equations and inequalities. Simple demonstration of the use of Mathematical packages (e.g. Maple, Mathematica, MATLAB) for the solution of real life problems.

MTS 497: SEMINAR I (1 Unit)
A seminar to be delivered in any area of interest in mathematics by every final year student which may or may not form part of the Project Topic

MTS 498: SEMINAR II (1 Unit)
A seminar to be delivered in any area of interest in mathematics by every final year student which may or may not form part of the Project topic.

MTS 499: PROJECT (4 Units)
Independent research work in Mathematics

DEPARTMENT OF PHYSICS

BACHELOR OF SCIENCE IN PHYSICS

HISTORY

The Department of Physics, College of Natural Sciences, is one of the foundation Departments of the University established in 1988. Recent changes in nomenclature and academic programmes led to a change in the former name (i.e. Department of Physical Sciences) to its present name.

By and large, the Department has contributed significantly to the development of the University and is still striving to ensure that the aims for which the University is established are achieved.

The Department of Physics offers a single honours degree programme in Physics as well as Postgraduate programmes leading to the award of Master of Science and Doctor of Philosophy in various areas of specializations in Physics. Some graduates of the Department are presently on the staff list of the Department as academic staff.

PHILOSOPHY AND OBJECTIVES

The goal of the B.Sc. degree programme in Physics is to produce skilled manpower that is adequately furnished with the comprehensive information required for engaging in meaningful research and industrial applications.

The objectives of the B.Sc. degree programme in Physics are:

- To provide students with a broad and balanced foundation of Physics knowledge and practical skills.
- To instill in students a sense of enthusiasm for Physics, an appreciation of its applications in different contexts.
- To involve the students in intellectually stimulating and satisfying experience of learning and studying.
- To develop in students the ability to apply their knowledge and skills in Physics to theoretical and practical problems.
- To develop in students, through an education in Physics a range of transferable skills of values in Physics and other areas.
- To provide students with a knowledge and skill base for further studies in Physics or multi-disciplinary areas involving Physics.

	3 YEAR PROGRAMME	4 YEAR PROGRAMME
(A)University Compulsory Courses		
(i) General Studies (GNS)	5	9
(ii) Relevant Compulsory Course (ETS 206 and PHS 364)	3	3
(iii) 100Level Courses	-	-
(B) Core Courses	-	
(i) 100 Level	-	41
(ii) 200 Level	38	38
(iii) 300 Level	16	16
(iv) 400 Level	39	39
(v) IndustrialTraining	16	16
(C) All Electives	**21**	**21**
Total	**138**	**183**

Academic Staff

Name	Qualification	Specialization	Designation
B. S. Badmus	B.Sc., M.Sc. (Ibadan), Ph.D. (Lagos)	Applied Geophysics	Professor and HOD
A. O. Mustapha	B. Sc., M. Sc. (Zaria), Ph.D. (Nairobi)	Radiation & Health Physics	Professor
O. D. Akinyemi	B.Sc., M.Sc., Ph.D. (Ibadan)	Solid Earth Physics	Professor
G. A. Adebayo	B.Sc. (Abeokuta), M.Sc., Ph.D.(Ibadan)	Theoretical Condensed Matter Physics	Professor
V. F. Makinde	B.Sc., M.Sc.(Ilorin), Ph.D(Zaria)	Applied Geophysics	Professor
Itunu C. Okeyode	B.Sc., M.Sc., Ph.D. (Ibadan)	Radiation & Health Physics	Reader
Olufunmilayo O. Alatise	B.Sc., M.Sc., M.Phil. (Ibadan), Ph.D. (Abeokuta)	Radiation & Health Physics	Senior Lecturer
F. G. Akinboro	B.Sc. (Madras), PGD (Madras), M.Sc. (Lagos), Ph.D. (Abeokuta)	Environmental (Solar Physics)	Senior Lecturer
J. O. Akinlami	B.Sc., M.Sc., Ph. D. (Ibadan)	Theoretical Condensed Matter Physics	Senior Lecturer
G. O. Layade	B.Sc., M.Sc. Ph.D. (Ibadan)	Geophysics	Senior Lecturer
A. A. Alabi	B.Sc., M.Sc. (Ibadan), Ph.D. (Abeokuta)	Geophysics	Senior Lecturer
O. T. Olurin	B.Sc., M.Sc. Ph.D. (Abeokuta)	Geophysics	Lecturer I
S. A. Ganiyu	B.Sc., M.Sc. Ph.D. (Abeokuta)	Geophysics	Lecturer I
O. P. Adebambo	B.Sc., M.Sc. Ph.D. (Abeokuta)	Theoretical Condensed Matter Physics	Lecturer II

100 Level: First Semester

Course Code	Course Title	U	L	T	P
PHS 101	General Physics I	3	2	1	-
PHS 191	Physics Laboratory I	1	-	-	1
MTS 101	Algebra	3	2	1	
MTS 103	Vectors & Geometry	2	2	-	
BIO 101	General Biology I	2	2	-	
BIO 103	Intro. to Physiology	2	2	-	-
BIO 191	Practical Biology	1	-	-	1
CHM 101	Physical Chemistry I	3	3	-	
CHM 191	Practical Chemistry I	1	-	-	1
GNS 101	Use of English	2	2	-	
GNS 111	Introduction to social problems	1	1	-	
CSC 101	Introduction to Computer Science	3	2	-	**1**
	Total	**24**	**18**	**2**	**4**

100 Level: Second Semester

Course Code	Course Title	U	L	T	P
PHS 102	General Physics II	3	2	1	-
PHS 192	Physics Laboratory II	1	-	-	1
MTS 102	Calculus and Trigonometry	3	2	1	-
MTS 104	Mechanics	3	2	1	-
BIO 102	General Biology II	2	2	-	-
BIO 192	Practical Biology II	1	-	-	-
CHM 102	Intro. Organic Chemistry	2	2	-	1
CHM 104	Intro. Inorganic Chemistry	2	2	-	-
CHM 192	Practical Chemistry II	1	-	-	1
GNS 102	Intro. To Nigerian History	1	1	-	-
CSC 102	Introduction to Computer Algorithm Techniques	2	2	-	-
	Total	**21**	**15**	**3**	**3**

200 Level: First Semester

Course Code	Course Title	U	L	T	P
PHS 211	Classical Physics I	2	2	-	-
PHS 231	Waves and Optics	3	2	1	-
PHS 233	Introduction to Space Physics	2	2	-	-
PHS 251	Introductory Modern Physics	3	2	1	-
PHS 291	Experimental Physics I	1	-	-	1
CSC 203	Computer Programming I	3	2	-	1
MTS 241	Mathematical Method I	3	2	1	-
STS 201	Statistics for Agricultural and Biological Sciences	3	2	1	-
AGE 321	Workshop Practice	2	1	-	1
	Total	**25**	**17**	**5**	**3**

200 Level: Second Semester

Course Code	Course Title	U	L	T	P
PHS 222	Thermal Physics	3	2	1	-
PHS 242	Electronics I	3	2	1	-
PHS 292	Experimental Physics II	1	-	-	1
CSC 204	Computer Programming II	3	2	-	1
MTS 232	Ordinary Differential Equation	3	2	1	-
GNS 201	Writing & Literary Appreciation	1	1	-	-
GNS 203	Use of Library	1	1	-	-
GNS 202	Elements of Politics and Government I	1	1	-	-
GNS 204	Logic and History of Science	2	2	-	-
ETS 206	Entrepreneurial Studies I	2	2	-	-
PHS 362	Introductory Materials Science	3	2	1	-
PHS 364	Energy and environment	1	1	-	-
	Elective	3	2	1	-
	Total	**27**	**20**	**5**	**2**
	ELECTIVE COURSES				
MTS 214	Complex Analysis I	3	2	1	-

300 Level: First Semester

Course Code	Course Title	U	L	T	P
PHS 311	Analytical Mechanics I	3	2	1	-
PHS 351	Quantum Physics	3	2	1	-
PHS 341	Electromagnetism	3	2	1	-
PHS 361	Introductory Solid State Physics	3	2	1	-
PHS 391	Advance Physics Laboratory I	1	-	-	1
PHS 353	Introductory Nuclear Physics	3	2	1	-
	Electives (1 Maths, 1 Physics)	6	4	2	-
	Total	**22**	**14**	**7**	**1**
	ELECTIVE COURSES				
MTS 311	Groups and rings	2	2	-	-
MTS 323	Real Analysis II	3	2	1	-
PHS 355	Biophysics I	3	2	1	-
PHS 357	Health Physics I	3	2	1	-
PHS 383	Physical theory of Remote Sensing	3	2	1	-
PHS 345	Ionosphere Physics I	3	2	1	-

300 Level: Second Semester

Course Code	Course Title	U	L	T	P
PHS 390	Industrial Training/Field Work	4	-	-	4
PHS 394	IT Inspection/Visitation	4	-	-	4
PHS 396	IT Report	4	-	-	4
PHS 398	IT Seminar	4	-	-	4
	Total	**16**	**-**	**-**	**16**

400 Level: First Semester

Course Code	Course Title	U	L	T	P
PHS 411	Quantum Mechanics I	3	2	1	-
PHS 421	Statistical and Thermal Physics	3	2	1	-
PHS 441	Electromagnetic Waves and Optics	3	2	1	-
PHS 461	Solid State Physics	3	2	1	-
PHS 471	Methods in Mathematical Physics 1	3	2	1	-
PHS 473	Computational Physics	3	2	1	-
PHS 497	Seminar I	1	-	-	1
	Electives	6	4	2	-
	Total	**25**	**16**	**8**	**1**
	ELECTIVE COURSES				
PHS 451	Nuclear Physics	3	2	1	-
PHS 453	Biophysics II	3	2	1	-
PHS 455	Health Physics	3	2	1	-
PHS 463	Materials Science	3	2	1	-
PHS 413	Solid Earth Physics	3	2	1	-
PHS 443	Electronics II	3	2	1	-

400 Level: Second Semester

Course Code	Course Title	U	L	T	P
PHS 412	Quantum Mechanics II	3	2	1	-
PHS 442	Analytical Mechanics II	3	2	1	-
PHS 450	Atomic and Molecular Spectroscopy	3	2	1	-
PHS 472	Methods of Mathematical Physics II	3	2	1	-
PHS 492	Advanced Physics Lab II	1	-	-	1
PHS 494	Entrepreneurial Studies For Physics Students	2	-	-	2
PHS 498	Seminar II	1	-	-	1
PHS 499	Project	4	-	-	4
	Electives	3	2	1	-
	Total	**23**	**10**	**5**	**8**
ELECTIVE COURSES					
PHS 460	X-ray Crystallography and Structural Analysis	3	2	1	-
PHS 464	Geomagnetics	3	2		-
PHS 468	Semiconductor Devices	3	2	1	-
PHS 482	Ionospheric Physics	3	2	1	-

COURSE SYNOPSES

PHS 101: GENERAL PHYSICS (3 UNITS)

Units and Dimensions: Rectilinear Motion, Newton's, Laws. Equilibrium moment, friction, motion in a plane, gravitation, circular motion, S.H.M, .work, energy, conservation of energy, elasticity, Young's modulus, bulk modulus, elementary principles of hydrostatistics and hydrodynamics. Temperature, heat, thermometers,

internal energy and Mechanical Equivalence of heat. Elementary treatment of the contents of the laws of thermodynamics.

PHS 102:GENERAL PHYSICS 11 (3 UNITS)

Electric charges, fields, potential, Coulomb's Law, Direct current and measuring instruments; the potentiometer method. Chemical, thermal and magnetic effects of current. Electromagnetic waves; basic phenomena of physical optics for illustration (interference, diffraction, polarization). Radiation and the photon. Atomic theory, radioactivity.

PHS 105: PHYSICS FOR AGRICULURE AND BIOLOGICAL STUDENTS I (3 UNITS)

Linear motion, motion in a circle and simple harmonic motion, gravitation, static and hydrostatics, elasticity, friction, viscosity and surface tension. Heat, temperature and thermometers. Expansion of solids, liquid and gases. The gas laws, change of state, kinetic theory of matter. Heat transfer.

PHS 106: PHYSICS FOR AGRICULTURE AND BIOLOGICAL SCIENCES STUDENTS II (3 UNITS)

Waves and Resonance – Propagation of light at plane and curved surface. The human eye and optical instruments. Radioactivity and useful effects of radiation current and static elasticity, introductory magnetism and alternating currents. Introductory atomic physics and electronics.

PHS 191: PHYSICS LABORATORY I (1 UNIT)

Selected experiments relating to the theoretical courses PHS 101. The experiments should illustrate basic techniques, observations, quantitative measurement, graphical representation, analysis and deductions from the data and error analysis. They must also acquaint students with a cross-section of basic measuring instruments.

PHS 192:PHYSICS LABORATORY II (1 UNIT)

Selected experiments relating to the theoretical courses PHS102. The experiments should illustrate basic techniques, observations, quantitative measurement, graphical representation, analysis and deductions from the data.

PHS 211: CLASSICAL PHYSICS (2 UNITS)

An introduction to classical mechanics, space and time, straight line kinematics, motion in a plane; forces and equilibrium particle dynamics, collisions and conservation laws, work and potential energy; inertia forces and non-inertia frames; central force motions; rigid bodies and rotational dynamics.

PHS 222: THERMAL PHYSICS (3 UNITS)

Heat energy conduction, convention, radiation, Zeroth Law of thermodynamics and

temperature definition: the first law –work, heat internal energy. Carnot cycles and the second law; entropy and irreversibility. Thermodynamic potential. Qualitative discussion of phase transitions. Elementary kinetic theory of gases; Boltzman counting, Maxwell-Boltzman law of distribution of velocities. Simple applications.

PHS 231: WAVES AND OPTICS (3 UNITS)

The harmonic oscillator. Aquatic waves, waves on a string. Superposition, energy in wave motion; progressive and standing waves; longitudinal and transverse waves; group and phase velocity. Doppler effect. Physical Optics; interference, diffraction, thin films, crystal diffraction, holography, dispersion and scattering. Geometrical optics; waves and rays; reflection and refraction at a spherical surface; thin lenses, optical lenses, mirror and prisms. Ultrasound.

PHS 233: INTRODUCTION TO SPACE PHYSICS (2 UNITS)

Introduction to Astronomy and Astrophysics, Satellite Communication, Introduction to Atmospheric Physics, Space Environment, Space craft systems and dynamics, Aero/Astrodynamic Engineering, Rocket Engineering, Cosmology, Origin of Universe and life, Space law and Business development

PHS 242: ELECTRONICS I (3 UNITS)

D. C. circuits; Kirchhoff's laws, network analysis and circuits, Galvanometers, A.C. circuits; inductance, capacitance, impedance and admittance, RMS and peak values, power. RLC circuits, Q-factor, resonance, circuit theorems, filters, Electronics; Semiconductors, pn-junction, diodes, Rectifiers. Field effect transistors, bipolar transistors. Amplifiers. Feedback oscillators.

PHS 251: INTRODUCTRY MODERN PHYSICS (3 UNITS)

Special relativity theory; defects of Newtonian Mechanics, the speed of light, the Loreniz transformation, transformation of velocities. Experimental basis of Quantum Theory; black body radiation, photo electric effect. Bohr's theory, de Broglie hypothesis, the Uncertainty Principle, the Schrödinger Equation. Periodic system of elements and atomic spectra. The atomic nucleus.

PHS 291: EXPERIMENTAL PHYSICS I (1 UNIT)

Seven (7) carefully selected experiments from all areas of physics including Modern Physics to teach basic experimental techniques. In addition, analysis and eventual demonstration of famous experiments should supplement the students' practical laboratory work. Emphasis at this level, however, remains classical physics.

PHS 292: EXPERIMENTAL PHYSICS II (1 UNIT)

Eight (8) carefully selected experiments from all areas of physics including Modern Physics to teach basic experimental techniques. In addition, analysis and eventual

demonstration of famous experiments should supplement the students' practical laboratory work. Emphasis at this level, however, remains classical physics.

PHS 311: ANALYTICAL MECHANICS (3 UNITS)

Newtonian Mechanics – Motion of A Particle in One, Two and Three Dimensions, Work, Power and Kinetic Energy; Conservative Forces and Potentials - Potential Energy or Potential, Conservation of Energy, Impulse, Torque and Angular Momentum, Conservation of Momentum, Conservation of Angular Momentum, Central Force Problems; Oscillations - Periodic Motion, Simple Harmonic Motion, Damped Oscillations and Forced Vibrations or Oscillations; Collision of Particles, Moving Frame of Reference and Elementary Mechanics of Rigid Bodies

PHS 341: ELECTROMAGNETISM (3 UNITS)

Electrostatistics and magnetostatics. Laplace"s equation and boundary value problem. Multiple expansiosns, dielectric and magnetic materials. Faraday"s Law, A.C. circuits, Mazwell's equations. Lorentz covariance and special relativity.

PHS 345 : IONOSPHERIC PHYSICS 1 (3 UNITS)

Telecommunications system in use. Ionospheric properties. Direct lines, transmission lines, radio waves and microwaves. Radar and satellite communication, characterisation and data sources. Signals and noise modulation and demodulation techniques. Channel and frequency allocation, broadcast bands, transreceivers.

PHS 351: QUANTUM PHYSICS (3 UNITS)

Wave-particle duality and the uncertainty principle; basic principles of the quantum theory; energy levels in potential wells, reflection and transmission of potential barriers.

PHS 353: INTRODUCTORY NUCLEAR PHYSICS (3 UNITS)

Nuclear structure, nuclear properties, binding energy and stability. Nuclear forces, nuclear-nucleon scattering, the neutron. Nuclear models; liquid drop, shell and collective model. Introductory notions about classification of elementary particles and their interactions.

PHS 355: BIOPHYSICS I (3 Units)

Scaling and the sizes of things, running speeds and the running long jump. Bone-breaking forces in jumping. Distribution of mass in the human body, traction systems and forces in muscles and bones. Artificial gravity, the energetics of running and jumping. The flow of blood in the circulatory systems, energy and metabolic rates of animals, metabolic rates of humans,. Diffusion, osmosis and the elastic properties of

biological materials.

PHS 357: HEALTH PHYSICS 1 (3 UNITS)

Effects of radiation on living cells, Somatic and genetic damage. Acute whole body syndromes. Uses of radiation, industrial uses and medical uses. Radiation protection, principles and methods. Personnel monitoring using TLD and film.

PHS 361: INTRODUCTORY SOLID STATE PHYSICS (3 UNITS)

Crystal structure, crystal binding and elastic properties. Lattice vibrations and thermal properties. Free election theory. Energy band structures in metals, semiconductors and insulators. Superconductors and insulators. Superconductivity.

PHS 362: INTRODUCTORY MATERIAL SCIENCE (3 UNITS)

Atomic and molecular structure, crystals, metallic states, defects in crystals, conductors, semi-conductors and insulator. Alloy theory – application to industrial alloys-steel in particular. Engineering properties – their control. Hot and cold working, heat treatment, etc. Creep fatigue and fracture, Corrosion and corrosion control.. Non-metallic materials – glass, rubber, concrete, plastics, wood and ceramics. Elastic and plastic deformation. Effects in metals.

PHS 364: ENERGY AND ENVIRONMENT (1 UNIT)

Energy and power, demand, principles and outlook. The cost of transformation of energy. Thermal pollution, electrical energy from fossil fuels. Hydroelectric power generation. Cost, capacity, storage, reserves, efficiency and environmental effects of these. Electrical energy from nuclear reactors. Prospects for the future through the promise (and problems) of breeder reactors, fusion power, solar power, geothermal, tidal and wind power, etc.

PHS 383: REMOTE SENSING (3 UNITS)

Definition of remote sensing; the electromagnetic spectrum sensors; active systems, radar; laser, etc. data collection platforms. Air-planes, rockets, satellites, applications of remote sensing techniques in Agriculture; Geology; Forestry; Meteorology; Wildlife Management; and census taking.

PHS 390: INDUSTRIAL TRAINING/FIELD WORK (4 UNITS)

Students to go for 6 months industrial training

PHS 391: ADVANCED PHYSICS LABORATORY I (1 UNIT)

Experiments are chosen to cover the span of the 300 level courses (Mechanics, Optics and Waves Electricity). Special techniques to measure high temperatures and pressures and to achieve low temperature and high vacuum. Aspects which cannot

Propagation of plane waves. Reflection and refraction. Transmission lines, wave guides and resonate cavities. Radiation. Geometrical optics. Interference of waves, diffraction.

PHS 442: ANALYTICAL MECHANICS II (3 UNITS)

Newtonian mechanics of systems of particles. D'Alembert's principle; degree of freedom, generalized coordinates and Lagrange's formulation of mechanics; simple applications. The calculus of variations and the action principle. Hamiltonian mechanics. Invariance and conservation laws. Small oscillations and normal modes.

PHS 443: ELECTRONICS II (3 UNITS)

Frequency response analysis of electronic amplifiers, oscillators, directly coupled amplifiers, classes A. B. and C. Feedback amplifier, operational amplifiers – functions. Feedback circuits effect of negative feedback on bandwidth signal to noise ratio. Switching circuits, applications, Schmidt Trigger. Digital electronics, logic circuits, flip flop counters and shift registers. Analog of digital converters, digital voltmeters, introduction to microprocessors.

PHS 450: SPECTROSCOPY (3 UNITS)

General aspects of spectroscopy, Atomic spectra, hydrogen atom. Coupling schemes, vector model. Zeeman effect, hyperfine structure. Molecular spectra, diatomic molecules, Frank-Condon principle. Resonance spectroscopy. Applications of spectroscopy, ESSR, MNR and optical pumping. Mossbauer scattering.

PHS 451: NUCLEAR PHYSICS (3 UNITS)

Nuclear decays; Alpha decay, beta decay, gamma emission; nuclear reactions, Neutron physics, Fission and fusion. Thermonuclear reactions, Accelerators, Nuclear energy sources, Elementary particles and their classification.

PHS 453: BIOPHYSICS II (3 UNITS)

Membrane potentials and nerve impulse, electromagnetic blood, flow meter and effects of electric current on the human body. The ear and hearing. The eye and vision, visual acuity. The electron micro-scope; medical uses of lasers. Molecular spectroscopy. Radiation exposures and biological effects on humans.

PHS 455: HEALTH PHYSICS II (3 UNITS)

Atomic, optical, microwave and radiofrequency radiation and biomedical applications. Biomedical instrumentation and techniques.

PHS 460: X-RAY CRYSTALLOGRAPHY AND STRUCTURE ANALYSIS (3 UNITS)

Crystal morphology, crystal optics. Classification of crystals. X-ray diffraction

be done experimentally will be treated theoretically.

PHS 394: IT INSPECTION/VISITATION (4 UNITS)
Lecturers to visit the students on industrial training during the period of the industrial training

PHS 396: IT REPORT (4 UNITS)
Students to submit a detailed report of the 6 month industrial training

PHS 398: IT SEMINAR (4 UNITS)
Students will present a seminar on the 6 month industrial training

PHS 411: QUANTUM MECHANICS (3 UNITS)
The formulation of quantum mechanics in terms of state vectors and linear operators. Three dimensional spherically symmetric potentials. The theory of angular momentum and spin. Identical particles and the exclusion principles. Methods of approximation. Multielectron atoms.

PHS 412: QUANTUM MECHANICS II (3 UNITS)
Time-dependent and time-independent perturbation theory. Scattering theory, elastic potential scattering. Green's function and partial wave methods. Selected phenomena from each of atomic physics, molecular physics, solid state physics and nuclear physics are described and interpreted using quantum mechanical models.

PHS 413 (Previous PHS 314): SOLID EARTH PHYSICS (3 UNITS)
Seismology, Introduction to semi-structure of the earth's interior. Seismicity. Earth tremors and earth quakes mechanisms. Theory of seismometers used for the detection of earth movements. Introduction to theoretical seismology. Electromagnetic induction studies, earth currents and the electrical conductivity to the earth's interior. Paleo-magnetism, measurement of natural remnant magnetism, rock magnetism and magnetic properties of rocks. Continental drift, sea-floor spreading and tectonophysics.

PHS 421: STATISTICAL AND THERMAL PHYSICS (3 UNITS)
Basic concept of Statistical Mechanics; Microscopic basis of Thermodynamics and applications to macroscopic system, condensed states, phase transformations, quantum distributions; elementary kinetic theory of transport processes, fluctuation phenomena; Applications

PHS 441: ELECTROMAGNETIC WAVES AND OPTIC (3 UNITS)
Maxwell's equations and electromagnetic potentials. The wave equation.

methods, theory and applications. Polarisation, interference, dispersion in crystals. Single crystals and polycrystalline studies.

PHS 461: SOLID STATE PHYSICS (3 UNITS)

Dielectric properties. Magnetism, dia-para, ferro and antiferro-magnetism. Imperfections in solids (general idea).

PHS 463: MATERIALS SCIENCE (3 UNITS)

Imperfections in crystal structures, types of imperfection, dislocation theory. Phases in metal systems; phase diagrams, physical properties; electrical, Magnetic, thermal and optical. Mechanical properties, elasticity and plasticity of metals. Corrosion and oxidation, diffusion in metals. Recovery, recrystalization, and grain growth. Hardening processes and heat treatment of steels.

PHS 464: GEOMAGNETISM (3 UNITS)

Earth's magnetic field. Transient geomagnetic variations. The interaction of the solar plasma with the earth's magnetic field. Magnetic observatories.

PHS 468: SEMICONDUCTOR DEVICES (3 UNITS)

The physics, modeling and applications and selected semi-conductor devices, Brief review of junction and bipolar transistor physics. Major emphasis on MOS devices including field effect transistors and charge coupled devices. Consideration of advanced bipolar structures, Schottky barriers devices; device noise, light emitting diodes and photodetectors; technology of semi-conductor production.

PHS 471: METHODS OF MATHEMATICAL PHYSICS 1 (3 UNITS)

Linear Algebra; Transformation in linear vector spaces and metric theory; Functional analysis, Hilbert space, complete sets of orthogonal functions; linear operations. Special functions; Gamma, hypergometric, legendre, Bessel, Hermite and Lagrangian functions. The Dirac delta function. Integral transforms and fourier series; Fourier series and Fourier transforms. Application of transform methods to the solution of elementary differential equations in physics and engineering.

PHS 472: METHODS OF MATHEMATICAL PHYSICS 11 (3 UNITS)

Partial differential equations; solutions of boundary value problems of P.D.E. by various methods (Separation of variables, method of inter-transforms). Sturm-Lioville theory, uniqueness of solutions. Calculus of residues and applications to evaluation of integrals, and the summation of series. Applications to various physical situations which may include electromagnetic theory, quantum theory and diffusion phenomena.

PHS 473: COMPUTATIONAL PHYSICS (3 UNITS)
Use of numerical methods, in physics. Various methods of numerical differentiation and intergration. Numerical solutions of some differential equations of interests in physics. Statistical analysis of data.

PHS 482: IONOSPHERIC PHYSICS (3 UNITS)
The neutral atmosphere. Production of ionospheric layers, chapman's theory, transport processes, morphology of the ionosphere. Ionospheric phenomena such as solar flare effects, sporadic E sporadic F and other irregularities, Ionosphere irregularities, ionospheric storms. Ionospheric measurements. Geomagnetism and the ionosphere.

PHS 492: ADVANCED PHYSICS LABORATORY I/II (2 UNITS EACH)
Experiments are chosen to cover the span of the 300 level courses (Optics, Electricity, Electronics, Atomic, Molecular, Nuclear and Low-temperature Physics). Special techniques to measure high temperatures and pressures and to achieve low temperature and high vacuum. Aspects which cannot be done experimentally will be treated theoretically.

PHS 494: ENTREPRENEURIAL STUDIES FOR PHYSICS STUDENTS (2 UNITS)
Electrical, Electronics, Metal and Wood workshop practices.

PHS 497: SEMINAR I (1 Unit)
Pre-field

PHS 498: SEMINAR II (1 Unit)
Post-Field

PHS 499: PROJECT (4 Units)

DEPARTMENT OF STATISTICS

BSc. (HONS) IN STATISTICS

Introduction and General Background

The Department of Statistics offers a degree programme in Bachelor of Science (B.Sc), Postgraduate Diploma, Masters and Doctor of Philosophy degrees in Statistics.

The Department of Statistics was an arm of the then Mathematical Sciences Department established in 1988 at the inception of UNAAB. In 2005/2006 session, the Department of Statistics evolved to become a unique academic division in the production of highly trained graduates and postgraduates in Statistics.

Philosophy and Objectives

Statistics is a subject with a broad spectrum of application in physical and life Sciences, Engineering, Education and Social Sciences.

The programme is intricately designed to give students opportunity to obtain broad knowledge in theory and application of Statistics. The specific objectives are:

1. To train professional Statisticians with required knowledge and experience in problem solving in all sectors of the economy.
2. To train a strong disciplinary core of Statisticians to pursue the study of scientific and technological problems by using statistical techniques and to undertake research in various branches of statistics that are relevant to national planning.
3. To produce graduates with wide horizon in statistics that will be relevant in research and academic development.
4. To provide instructions in Statistics to candidates in courses of study in other departments of the University.
5. To produce graduates that will be job creators through consultancy services in the area of statistical analysis.

Graduation Requirements

For the award of a Bachelor of Science in Statistics, a student should have satisfied the following approved minimum academic standards:

a. He/She must have spent not less than 3 or 4 academic years depending on the point of entry
b. He/She must not exceed the minimum periods above by more than two academic sessions;
c. He/She must have passed all the University (Compulsory) courses;
d. He/She must have passed all the College/Department (Core) courses and the required electives;
e. His/Her CGPA at the end of the programme must not be less than 1.0

Academic Staff

Name	Qualification	Specialization	Designation
O. M. Olayiwola	ND (Kwara), HND (Ibadan), PGD (Ibadan) BSc. (Ilorin), MSc., Ph.D. (Ibadan),	Sample Survey & Statistical Inference	Senior Lecturer & Ag. Head of Department
O. E. Asiribo	B.Sc. (Zaria), M.Sc. (Reading), Ph.D. (Wisconsin)	Statistical Modeling & Experimental Design	Professor
**G. N. Amahia	PDS, B.Sc., M.Sc. Ph.D. (Ibadan),	Sample Survey & Statistical Inference	Professor
**D. A. Agunbiade	B.Sc., M.Sc., MinfSc., Ph.D. (Ibadan)	Econometrics & Statistical Inference	Reader
S. O. N. Agwuegbo	B.Sc. (UNN), M.Sc.(Lagos), Ph.D. (Abeokuta)	Stochastic Processes & Time Series	Reader
Fadeke. S. Apantaku	Bsc., MSc. (Ibadan), Ph.D. (Abeokuta)	Sample Survey & Statistical Inference	Senior
G. A. Dawodu	B.Sc., M.Sc. (Lagos), PGDC, M.Sc., Ph.D. (Abeokuta)	Statistical Computing & Modeling	Senior Lecturer
**A. A. Akomolafe	BSc.(Ilorin), MSc., Ph.D. (Ibadan)	Statistical Inference	Senior Lecturer
+Abosede A. Akintunde	B.Sc., M.Sc., Ph.D. (Abeokuta)	Stochastic Processes & Time Series	Lecturer II
O. S. Ariyo	B.Sc., M.Sc. (Abeokuta)	Multivariate Analysis and Experimental Design	Lecturer II
Oluwaseun. A. Wale-Orojo	PDS, B.Sc., M.Sc. (Ibadan)	Sample Survey and Experimental Design	Lecturer II
K. M. Yusuff	ND (Iree), B.Sc., M.Sc. (Ibadan)	Experimental Design & Quality Control	Lecturer II
A. T. Soyinka	ND (Bida), B.Sc., M.Sc. (Abeokuta)	Distribution Theory and Applications; Statistical Modelling and Inference	Assistant Lecturer

**Associate Lecturer

+On Study Leave

Academic Curriculum

Distribution and Category of Courses

The distribution of the *compulsory*, *core* and *elective* courses are as shown below:

S/No	Category of Courses	3years DIRECT	4years UME
a.	**University compulsory courses**		
	i) Entrepreneurship studies	2	2
	ii) General Studies (GNS)	5	9
	ii) Other compulsory courses	-	2
b.	**College/Departmental Core Courses**		
	i. 100 Level	-	44
	ii. 200 Level	45	45
	iii. 300 Level	23	23
	iv. 400 Level	45	45
	v. Industrial Training	16	16
c.	**Electives**	6	6
d.	**Total Units**	129	173

100 Level: First Semester

Course Code	Course Titles	U	L	T	P
BIO 101	General Biology I	2	2	-	-
BIO 191	Biology Practical	1	-	-	1
CHM 101	Physical Chemistry I	3	2	1	-
CHM 191	Practical Chemistry I	1	-	-	1
CSC 101	Fundamentals of Computer Science	2	2	-	-
GNS 101	Use of English	2	2	-	-
PHS 101	General Physics I	3	2	1	-
PHS 191	Physical Laboratory I	1	-	-	1
MTS 101	Algebra	3	2	1	-
STS 101	Descriptive Statistics	2	1	1	-
STS 181	Probability I	3	2	1	-
	TOTAL	**23**	**15**	**5**	**3**

Candidates are required to register for a minimum of 6 units of PHS or CHM for 100 level.

100 Level: Second Semester

Course Code	Course Title	U	L	T	P
AEM 102	Principles of Economics	2	2	-	-
CHM 104	Introductory Inorganic Chemistry	2	2	-	-
GNS 102	Introduction to Nigerian History	1	1	-	-
GNS 111	Introduction to Social Problems	1	1	-	-
MTS 102	Calculus and Trigonometry	3	2	1	-
PHS 102	General Physics II	3	2	1	-
STS 104	Statistical Computing I	2	2	-	-
STS 112	Statistical Inference I	3	2	1	-
STS 122	Basic Statistical Methods	3	2	1	-
STS 192	Statistical Inference Laboratory I	1	-	-	1
	TOTAL	**21**	**16**	**4**	**1**
*STS 102	Introduction to Statistics	2	2	-	-

* Course for Non-major students

200 Level: First Semester

Course Code	Course Title	U	L	T	P
CSC 203	Computer Programming I	3	2	-	1
MTS 211	Abstract Algebra	3	2	1	-
MTS 223	Real Analysis	3	2	1	-
MTS 241	Mathematical Methods I	3	2	1	-
STS 213	Distribution Theory I	3	2	1	-
STS 225	Biometric Methods I	3	2	1	-
STS 281	Probability Theory II	3	2	1	-
	TOTAL	**21**	**14**	**6**	**1**
*STS 201	Statistics for Agric. & Biological Sciences	4	3	1	-
*STS 203	Statistics for Physical Sciences & Engineering	4	3	1	-

*Courses for Non-major students

200 Level: Second Semester

Course Code	Course Title	U	L	T	P
CSC 204	Computer Programming II	3	2	-	1
CSC 214	System Analysis & Design	3	2	-	1
ETS 206	Entrepreneurship Studies & Change Mgt.	2	2	-	-
GNS 201	Writing and Literary Appreciation	1	1	-	-
GNS 202	Elements of Politics & Government	1	1	-	-
GNS 203	Use of Library	1	1	-	-
GNS 204	Logic and History of Science	2	2	-	-
MTS 232	Ordinary Differential Equations	2	1	1	-
STS 204	Statistical Computing II	2	2	-	-
STS 212	Statistical Inference II	3	2	1	-
STS 214	Introduction to Social & Economic Statistics	3	2	1	-
STS 292	Statistical Inference Laboratory II	1	-	-	1
	TOTAL	**24**	**18**	**3**	**3**