NATIONAL OPEN UNIVERSITY OF NIGERIA

FACULTY OF SCIENCES

HANDBOOK FOR STUDENTS

Vision Statement

- Our vision is to be the foremost Faculty in terms of quality and relevance of curriculum, research and instruction, making science training available to and accessible by all at competitive yet affordable cost on the open distance learning platform.

Mission Statements

The Faculty of Sciences is committed to:

- providing a comprehensive and relevant distance learning curriculum in science based programmes
- producing well-informed graduates for careers in academia, industry and government
- conducting high-quality research in science-related disciplines
- Encouraging and supporting strong cross-disciplinary, interdisciplinary, and multi-disciplinary collaborations both within and beyond the University (nationally and internationally)

CORE VALUES

Our Core Values in the Faculty of Sciences are:

Excellence: We will continue to set our sights and standards high.

Achievement: We will capitalize on our distinctive strengths and unique opportunities to excel in an increasingly competitive world.

Collegiality: We will maintain an inclusive and supportive yet challenging environment that attracts the best students, staff and faculty, working together with mutual respect.

Innovation: We will be creative in our efforts to achieve our objectives.

Relevance: We will seek to continually improve our programs, ensuring that they are appealing and well suited to the society and development, equipping our graduates for successful career and future.

Collaboration: We will initiate mutually beneficial relationships with a variety of partners to ensure development of facilities, programmes and research for community development and service.

Sustainability: We will maintain our self-sufficiency by seeking efficiencies and being entrepreneurial in our approach to challenges.

FOREWORD FROM THE VICE-CHANCELLOR

One of the important documents usually requested by Faculty accrediting agencies is the handbook. This document contains all information on registration, available courses, course contents, examinations and staff.

In the case of the National Open University of Nigeria, the Handbook must contain a brief history and modus operandi of the institution as well as the organizational structure of the University. Being a Unique University, it is imperative to avail all current and prospective students with information on quality assurance, strategic plan of the University at large and the objectives and philosophy of the school.

All these have been succinctly outlined in the document which has been put together by the Faculty of Sciences. It is compulsory for every student to have a copy of this handbook. This edition is a review of the University wide volume which was given to the students upon registration. The Faculty of Sciences is for a period of Four years. This means that on or before the expiration of this period, there must be a review having in mind developments in the Faculty.

I therefore recommend the Faculty of Sciences Handbook to all students and other persons who are interested in the Faculty of Sciences prograqmme of the University.

Professor Abdalla Uba Adamu

Vice-Chancellor

WELCOME FROM THE DEAN

Science is bedrock of development of a nation. It is with this understanding that the Blueprint that set up the National Open University of Nigeria included as one of the cohorts of Schools, Science and Technology. The Faculty started as the School of Science and Technology at inception, consisting of programmes in Agricultural Sciences, Health Sciences, and Science and Technology. In 2013 the en School of Science and Technology birthed two other Schools and was hence split into three in line with the programmes mounted. Consequently, we had School of Agricultural Sciences, School of Health Sciences and School of Science and Technology without defined departments. In 2016, the University adopted the faculty system with defined departments and the School of Science and Technology metamorphosed into the Faculty of Sciences.

The Faculty of Science has four departments namely; Department of Computer Science, Department of Environmental Sciences, Department of Mathematics and, the department of Pure and Applied Sciences. The handbook gives an overview of the different programmes mounted by the different departments of the Faculty. It provides a summary of the course outline and details of the curriculum to cover. It also provides information on graduation requirements and it is a must have for any serious-minded student of the Faculty of Sciences. The faculty handbook also contains information related to student registration, choice of courses, programme duration, graduation requirements, together with other relevant matters that will enhance the students understanding of the Faculty and its programmes as well as job prospects. Contained also in the handbook, are information that deal with brief history of National Open University of Nigeria. It is therefore quite expedient that all students of the Faculty of Sciences have a copy of this handbook, which will also assist them in decision making. For those who may be planning to undertake a programme in our faculty of excellence, this handbook also comes in handy.

Our programmes are tailored towards lifelong learning because we believe there should be no impediment to learning. Programmes curricula are geared at ensuring access to as many people as qualify to pursue knowledge in the science domain and enhance national development. I therefore, welcome you to the Faculty of Sciences, the faculty of excellence and the bedrock of national development.

Professor Monioluwa Omolara Olaniyi

Dean, Faculty of Sciences

PART 2: ABOUT THE FACULTY OF SCIENCES

2.0 Introduction

The Faculty of Sciences is one of the Faculties in the National Open University of Nigeria. It comprises of four departments namely:

i. Computer Science

ii. Environmental Sciences

iii. Mathematics

iv. Pure and Applied Sciences

These Departments offer different Programmes at both undergraduate and postgraduate levels. The Faculty has a total number of 52 academic staff and 9 non-academic staff. We value excellence, achievement and innovation. Our dream is to provide leadership in readily accessible science training and dynamically sustaining it.

Our Core Values in the Faculty of Sciences are as follows:

a. Excellence: We will continue to set our sights and standards high.
b. Achievement: We will capitalize on our distinctive strengths and unique opportunities to excel in an increasingly competitive world.
c. Collegiality: We will maintain an inclusive and supportive yet challenging environment that attracts the best students, staff and faculty, working together with mutual respect.
d. Innovation: We will be creative in our efforts to achieve our objectives.
e. Relevance: We will seek to continually improve our programs, ensuring that they are appealing and well suited to the society and development, equipping our graduates for successful career and future.
f. Collaboration: We will initiate mutually beneficial relationships with a variety of partners to ensure development of facilities, programmes and research for community development and service.
g. Sustainability: We will maintain our self-sufficiency by seeking efficiencies and being entrepreneurial in our approach to challenges

2.1 Historical Background

The Faculty of Sciences was originally founded as the School of Science and Technology at resuscitation of the university in 2002. In 2013, two other Schools were calved out of it and three

Schools resulted namely: School of Science and Technology, School of Health Sciences and School of Agricultural Sciences. Subsequently, in July, 2016, when the university adopted the Faculty system with defined departments, the School of Science and Technology was renamed Faculty of Sciences comprising of four Departments namely:

1. Department of Computer Science (CSD)
2. Department of Environmental Sciences (ESD)
3. Department of Mathematics (MTH)
4. Department of Pure and Applied Sciences (PAS)

Vision Statement

The Faculty's vision is to be the foremost Faculty in terms of excellence and relevance of core curriculum, research and instruction, making science training available to and accessible by all at viable and yet affordable cost on the open distance learning platform.

Mission Statements

The Faculty of Sciences is committed to:

i. providing a comprehensive and relevant distance learning curriculum in science based programmes
ii. producing well-informed graduates for careers in academia, industry and government
iii. conducting high-quality research in science-related disciplines
iv. Encouraging and supporting strong cross-disciplinary, interdisciplinary, and multi-disciplinary collaborations both within and beyond the University (nationally and internationally)

2.2 Programmes

The Faculty of Sciences is located on the ground floor of the Faculty of Health Sciences Block in National Open University Headquarters at Plot 91Cadstral Zone, Nnamdi Azikiwe Expressway Jabi, Abuja. It is currently administering and coordinating eight undergraduate programmes and two postgraduate programmes namely:

i. BSc. Information Technology CSD

ii. BSc. Computer Science CSD

iii.	BSc. Mathematics	MTH
iv.	BSc. Mathematics with Computer Science	MTH
v.	BSc. Environmental Science and Toxicology	EST
vi.	BSc. Biology	PAS
vii.	BSc. Chemistry	PAS
viii.	BSc. Physics	PAS

2.3 Administration

The Faculty has a total number of seven Professors, two Associate Professors and Forty-seven Academic Staff in ranks ranging from Senior Lecturer to Assistant lecturers, in different areas of specialization.

The Faculty is headed by Professor Monioluwa Omolara Olaniyi, the Dean, assisted by a Deputy Dean, Dr. Juliana N. Ndunagu. The Administrative unit is managed by the Faculty Officer (FO), Miss. Mabel Madu, Principal Assistant Registrar, who reports directly to the Dean. The FO oversees the day to day running of the Faculty's facilities, and provides materials needed by Staff to execute their duties. Each of the four Departments is headed by:

1. Department of Computer Science — Dr. Vivian O. Nwaocha
2. Department of Environmental Sciences — Dr. Emily O. Iduseri
3. Department of Mathematics — Dr. Akeem B. Disu
4. Department of Pure and Applied Sciences — Dr. Emeka C. Ogoko

The Faculty of Sciences holds its Academic Board meeting statutorily every month, where issues bordering on academic and student matters, the progress of the Faculty and Staff are discussed. All Academic Staff are members of the Board while the Head of Administrative unit is the Secretary to the Board.

PART 3: INFORMATION FOR NEW STUDENTS

3.0 Introduction

3.1 Orientation Programme

Student orientation programme is done at their various Study Centers. The Study Center advices student on the process accordingly

3.2 Deferment of Admission

Is entertained only based on university policy and conditions

3.3 Change of Programme and Course

Student process change of courses via their respective study centers. The students download the required form via their Study Centers and process it through their respective Study Centers

3.3.1 Registered Students who wish to change their Programme of Study

Registered Students who wish to change their Programme of Study process it via their respective study centers. The students download the required form via their Study Centers and process it through their respective Study Centers.

3.3.2 New Students who were wrongly admitted to a Programme

3.3.3 Change of Course

3.3.4 Credit Transfer

See Attached

PROGRAMME AND DEGREE AWARD REQUIREMENTS

DEPARTMENT OF COMPUTER SCIENCE

4.0 Introduction

The Programmes in the Department of Computer Science programme are designed to equip the undergraduate students with the basic requirements for serving in a professional capacity in most areas of computing and Information Technology as well as well as develop knowledge in the theory of applied mathematics. The degree programmes would explore all the basic rudimentary or foundation knowledge of computer science and Information Technology not known to most of today's information users. It is also expected to equip students with the tools for computational techniques and information technologies as well as their thinking patterns, as they would be exposed to the fundamentals of Information Technologies, computing processes and principles.

4.1 Programme Duration

All courses in the Department of Computer Science runs for a minimum 4years (8 Semesters) for 100 level entry, 3years (6 Semesters) for 200 level entry and 2year (3 Semesters) for postgraduate courses.

4.2.1 Prerequisite Course

To be admitted into the B.Sc programmes in the Department of Computer Science, a candidate is expected to:

i. Have a minimum of Five credits in SSCE/GCE/NECO/NABTEB at not more than two (2) sittings obtained in the following subjects: English Language, Mathematics, Physics, Chemistry, Biology or Agricultural Sciences.
ii. For direct entry into 200 level of the programme, the candidate is expected to have attained a minimum of: any of the following
    a. Credit in English Language, Mathematics, Physics, Chemistry, Biology or Agricultural Sciences at the A- Level
    b. Upper Credit from a recognized institution in Computer Engineering, Computer Science, Electrical Electronics Engineering, Electrical Engineering at the Ordinary National Diploma level
    c. A minimum of lower credit from a recognized institution in Computer Engineering, Computer Science, Electrical Electronics Engineering, Electrical Engineering at the Higher National Diploma

4.2.2 Registration procedure

Student registration is done at their chosen study centers. The center furnishes the candidate with detailed registration process.

4.2.3. Opening and Closing of the Course Registration portal

The opening and closing of course registration portal is specified by the university in the published university calendar for the year.

4.3 Course re-registration

Student process "Course re-registration" through study centers. The center furnishes the candidate with details of the process.

4.4 Add and/or Drop courses

Student process "and/or drop courses" through study centers. The center furnishes the candidate with details of the process.

4.5 Eligibility for Graduation

In order to qualify for graduation, the Student should have attained a Course work load which must meet the graduation requirements of the University based on minimum academic standards. However, in doing so, the student must earn a minimum of 120 credit units for the four year programme in Computer Science. Direct entry (200-Level) students must earn a minimum of 90 credit units. Furthermore, the student would have passed all courses listed as core on the list of registerable courses which must include: all the GST, core Faculty and Departmental courses; CIT389, CIT403 and CIT499. On the whole, the minimum Cumulative Grade Point Average (CGPA) required for graduation is 1.5.

4.6 Research Projects

Individual project of approved topic related to the current research interests in the department. Students should embark on work that will lead to software development under the supervision of a member of staff. To be eligible for graduation, it is mandatory for every student to successfully complete a project and attain at least a credit upon final grading.

4.7 Grading, Moderation and Mode of Submission of Projects

4.7.1 Grading of research projects

Student project is graded by the assigned Supervisor. The grade is then approved/reviewed by the departmental academic board.

4.7.2 Mode of Submission of Projects

The project and the score sheet is then submitted to the Department through the Study Centre.

4.10 Degree Award Requirements

4.10.1 Compulsory and Elective Courses

Compulsory courses are courses which must be offered and passed before graduation. These courses are marked compulsory or 'C' in the list of courses to be registered each semester. They must be registered before registering any elective courses.

Elective courses are courses which a student chose from a number of optional courses in the list of courses of the semester.

Electives are courses you can choose, while compulsory courses are the ones you must study to complete your degree. Electives, when added to the compulsory courses, make up the total number of units needed to complete your degree. Elective courses are usually labeled Elective of 'E'.

4.10.2 Minimum course credits for graduation

In order to be considered for graduation, a student a student must have earned a total credit of 120 for regular entry students (100 Level entry) and 90 for direct entry students (200 level entry). A student must have passed ALL compulsory courses and have a CGPA must be at least 1.5 (minimum)

4.10.3 General Studies Courses (GST)

These are compulsory university courses which must be offered and passed before graduation.

ACADEMIC STAFF

S/N	NAMES	STATUS	QUALIFCATION
1.	Dr. Vivian O. Nwaocha	Senior Lecturer	Ph.D. Computer Science (2017) , M.Sc. Computer Science (2006), PGD Computer Science and Engineering (2002), B.Eng. Metallurgical and Material Engineering (1995)
2.	Dr. Gregory O. Onwodi	Senior Lecturer	Ph.D. Computer Science (2015), M.Sc. Information Technology (2004), B.Sc. Computer Science (1995)

3.	Dr. Juliana N. Ndunagu	Lecturer I	Ph.D. Computer Science (2009), M.Sc. Computer Science and Engineering (2001), PGDE Education (2008) , B.Sc. Mathematics (1986)
5.	Dr. Afolorunsho Adenrele	Lecturer I	Ph.D. Computer Science (2017), M.Sc. Computer Science (2006) B.Sc. Computer Science and Mathematics (1995)
6.	Mr. Oluwasogo O. Okunade	Lecturer I	Ph.D. Computer Science (in view), M.Sc. Computer Science (2009), Microsoft Technology Associate, Database Administration (MTA) (2011), Oracle 10g Certified Administrator (Oracle10OCA, 2006) , B.Sc. Computer Science (2004), ND Computer Science (2000)
7.	Dr. Adewale Adesina	Lecturer I	M.Sc., PhD. Computer Science
8.	Dr. Bukie Osang	Lecturer I	M.Sc., PhD. Computer Science
9.	Engr. Oguntala George A.	Lecturer II	Ph.D.(in view), M.Sc. System Engineering (2008), MBA Human Resource Management (2007), MPC Microsoft Certificate Professional (2005), CCNA Cisco Certified Network Associate (2005), B.Sc. Electronics /Computer Engineering (2001), MNIEE, MECS, MCPN, MNSE, MNIM, (Registered) (COREN Registered), MIEEE
10.	Mr. Enakeno Jituboh	Assistant Lecturer	M.Sc. Information System Management (2012), B.Sc. B.Eng. Computer Science Engineering (2007)
11	Mr.Oluwaseun Oluyide	Assistant Lecturer	M.Sc. Computer Science, B.Sc. Computer Science
12.	Mr. Eya Nnabuike	Assistant Lecturer	M.Sc. Networks and Communications (2012), B.Sc. Computer Science (2008)
13.	Mrs. Oluwatoyosi Victoria Oyewande	Assistant Lecturer	B.Sc. Computer Science, M.Sc.

Outline of Course Structure: The B. Sc., Honours, Information Technology

100 Level

Course Code	**Course Title**	**Unit**	**Status**
1st Semester			
GST 101	Use of English and Communication Skills I	2	C
GST 107	The Good Study Guide	2	C
BIO101	General Biology	2	C
CHM101	Introductory Inorganic Chemistry	2	C

CIT 101	Computers in Society	2	C
CIT 143	Introduction to Data Organisation and Management	2	C
MTH 121	Linear Algebra I	2	C
PHY 111	Elementary Mechanics	2	C
PHY 113	Heat and Properties of Matter	2	C
PHY 191	Introductory Practical Physics I	2	C
	Total Credit Units - Compulsory	**20**	
	Total Credit Units - Elective	**0**	
	Total Credit Units	**20**	
2nd Semester			
GST 102	Use of English and Communication Skills II	2	C
GST 105	History and Philosophy of Science	2	C
GST 122	Introduction to Philosophy & logic	2	C
CIT 102	Software Application Skills	2	C
CIT 132	Programming in BASIC	2	C
MTH102	Introductory Statistics	2	C
MTH 112	Differential Calculus	2	C
MTH 122	Integral Calculus	2	C
MTH 142	Vectors and Geometry	2	C
PHY 132	Electricity, Magnetism and Modern Physics	2	C
PHY 192	Introductory Practical Physics II	2	C
	Total Credit Units – Compulsory	**22**	
	Total Credit Units - Elective	**0**	
	Total Credit Units	**22**	

200 Level

Course Code	Course Title	Unit	Status
1st Semester			
GST 201	Nigerian Peoples and Cultures	2	C
CIT 211	Introduction to Operating Systems	3	C
CIT 215	Introduction to Programming Languages	3	C
CIT 237	Programming & Algorithms	3	C
MTH 211	Introduction to Set Theory and Abstract Algebra	3	E
MTH 241	Introduction to Real Analysis	3	E
MTH 281	Mathematical Methods I	3	C
	Total Credit Units – Compulsory	**14**	
	Total Credit Units - Elective	**6**	
	Total Credit Units ***N/B: Students are expected to offer at least one elective course per semester.*** **Maximum credit units allowed per semester is 25**	**20**	
2nd Semester			
CIT 208	Information Systems	2	C
CIT 212	Systems Analysis and Design	3	C
CIT 236	Analog and Digital Electronics	3	C
CIT 292	Computer Laboratory I	2	C
MTH 212	Linear Algebra II	3	E
MTH 232	Elementary Differential Equation	3	C
MTH 282	Mathematical Methods II	3	E
	Total Credit Units - Compulsory	**16**	

	Total Credit Units - Elective	**6**	
	Total Credit Units ***N/B: Students are expected to offer at least one elective course per semester.*** **Maximum credit units allowed per semester is 25**	**22**	

300 Level

Course Code	**Course Titles**	**Units**	**Status**
1st Semester			
CIT 303	Principles of Communication Technology	3	C
CIT 305	Networking and Communication Technology	3	C
CIT 309	Computer Architecture	3	C
CIT 311	Computer Networks	3	C
CIT 341	Data Structures	3	E
CIT 371	Introduction to Computer Graphics and Animation	3	E
CIT381	File Processing and Management	3	E
DAM 301	Data Mining and Data Warehousing	3	C
	Total Credit Units - Compulsory	**15**	
	Total Credit Units - Elective	**9**	
	Total Credit Units ***N/B: Students are expected to offer at least one elective course per semester.*** **Maximum credit units allowed per semester is 25**	**24**	

2nd Semester			
CIT 322	Introduction to Internet Programming	3	E
CIT 342	Formal Languages & Automata theory	3	C
CIT 344	Introduction to Computer Design	3	C
CIT389	Industrial Training	3	C
CIT 392	Computer Laboratory II	2	C
DAM344	Semantic Data Modelling	2	E
DAM 364	Management Information Systems (MIS)	2	C
DAM382	Information Systems Management	3	E
	Total Credit Units - Compulsory	**13**	
	Total Credit Units - Elective	**8**	
	Total Credit Units ***N/B: Students are expected to offer at least one elective course per semester.*** **Maximum credit units allowed per semester is 25**	**21**	

400 Level

Course Code	**Course Titles**	**Units**	**Status**
1st Semester			
CIT 403	Emerging Technologies	3	C
CIT 411	Microcomputers & Microprocessors	2	C
CIT 415	Introduction to E-commerce	3	E
CIT 427	Database Systems & Management	3	C
CIT 445	Principles & Techniques of Compilers	3	E
CIT 461	Internet Architecture & Communication	3	C
CIT 463	Introduction to Multimedia Technology	3	E

CIT 465	Network Administration	2	C
	Total Credit Units - Compulsory	**13**	
	Total Credit Units - Elective	**9**	
	Total Credit Units ***N/B: Students are expected to offer at least one elective course per semester.*** **Maximum credit units allowed per semester is 25**	**22**	
2nd Semester			
CIT 425	Operations Research	3	C
CIT 474	Introduction to Expert Systems	2	C
CIT 478	Artificial intelligence	2	E
CIT 484	Website Design & Programming	3	E
CIT 499	Project	4	C
DAM 461	Statistical Database System	3	C
	Total Credit Units - Compulsory	**12**	
	Total Credit Units - Elective	**5**	
	Total Credit Units ***N/B: Students are expected to offer at least one elective course per semester.*** **Maximum credit units allowed per semester is 25**	**17**	

N/B: B.Sc (Communication Technology Students) Students must accumulate a minimum of 120 credit units

to graduate.

4.2 Course Content Specifications For graduation with a B.Sc.(Hons) in Communication Technology, a student must have passed 125 units of compulsory courses with a minimum of 15 credit units from elective courses for 8 semester structure; while for 6 semester structure, a student must pass 90 credit units of compulsory courses with 20 credit units of elective courses. Find below the course descriptions:

GST101: Use of English and Communication Skill I (2 units)

(Outstanding)

GST107: The Good Study Guide (2 units)

(Outstanding)

CIT 101: Computers in Society (2 units)

What is Computer, Types of Computer, History of Digital Computer, Element of a Computer : Hardware and Software. How to work with a computer. Operating System Windows Files word processing, copying a text, saving, Changes to a document and Formatting, spelling checker and introduction to Printing a document. Spread sheet, Entering and correcting data. Using Formula, Numeric Formats Creating Charts. Types of Charts Power Points and presentation. Networking, Internet and E-mail. Reading and responding to an E-mail message.

MTH 111: Trigonometry (2 units)

Trigonometric functions; Radian measure, law of sine and cosine, sum, differences and product formulas. Trigonometric identities, Inverse trigonometric functions, solutions of Trigonometric equations. Graph of Trigonometry functions.

MTH 121: Linear Algebra I (2 units)

Definition of set, subset, union, intersection, complements, Venn diagram, null set, power sets, chain rule, tangent line to a space curve, tangent plane to a surface, maxima and minima, Taylor's formula. Symbolic logic and truth tables, Boolean algebra, open and close sentences; conjunction, disjunction, tautology and application of logics in circuit design.

PHY 111: Elementary Mechanics (2 units)

Physical quantities, unit and dimensions space and time, frames of reference, vestures and scalars, kinematics – straight line, line motion, vertical motion, circular motion, deviation. Dynamics – Equilibrium, work and energy, mass and momentum, laws of inertia, rotational

motion, simple harmonic motion, conservation laws, simple machines, fundamental laws of static and dynamics, Galilean invariance.

PHY 122: Heat and Properties of Matter (1 unit)

Heat and temperature, work and heat, heat capacities, thermal expansion of solids, liquids and gases, latent heat, gas laws, heat transfer, isothermal and adiabatic changes, laws of thermo dynamics. Simple kinetic theory of gases the Vander Waals gas. Basic concepts and properties of waves; types of waves, wave nature of light. Classification of matter into (solids, liquids and gases, forces between atoms and molecules, molecular theory of matter, elasticity, plasticity, Hook's Law, Young's Shear and bulk Moduli) Crystalline and non-crystalline materials, Hydro-dynamics-streamlines, Bernouli and continuity equations, turbulence, Reynold's number, Viscosity, laminar flow, Poiseville's equation, surface tension, adhesion, cohesion, capillary, drops and bubbles.

PHY 191: Introductory Practical Physics I (2 units)

Selected experiments on topics covered in PHY 111 and PHY 122, Application of a variety of simple experimental techniques with emphasis on quantitative measurements, experimental errors and graphical analysis.

GST102: Use of English and Communication Skill II (2 units)

(Outstanding)

GST 105: History and Philosophy of Science (2 units)

Nature of science, scientific methods and theories; Law of nature,; History of science. Lost sciences of Africa, science, technology and inventions. Nature and scope of philosophy in science. Man, nature and his origin. Man , environment and resources. Great Nigerian Scientists.

CIT 102: Application Software Skills (2 units)

Overview of the discipline of Computer Science General structure of a computer system; Historical development of computer systems; Generations of computer system; Computer operations; Internal structure of a computer hardware; Microcomputer technology; Computer numbering system;

computer arithmetic; computer data representation schemes; Problem solving with computers Elements of programming languages. Computers in the Society internet and its

facilities. Basic file processing concepts. Introduction to computer programming using VISUAL BASIC programming language; Algorithms, Data Structures and Logic; Laboratory exercises in VISUAL BASIC programming and the Internet.

CIT 132: Programming in BASIC (2 units)

Introduction to programming: Problem Solving Concepts, Flowcharting, and Programming Languages; Fundamental Concepts and Language Structure: statement structure, The BASIC Character Set, Predefined Functions; Solving simple problems with BASIC: BASIC statements – END, PRINT, LET, READ, DATA, RESTORE, INPUT, GOTO, IF-THEN, ON-GOTO, FOR-NEXT, STEP, DIM, GOSUB, RETURN, etc. Loops, Arrays, and Nested Loops, Constants, Variables, and Arithmetic Operations; Using predefined functions, Defining your own functions; Constructing and using subroutines; Formatting printed output: PRINT, TAB, PRINT USING, and Format statements; Storing and retrieving programs and data.

MTH102: Introductory Statistics (2 units)

Measures of central tendency and dispersion, (grouped and ungrouped); mean: - arithmetic and geometric, harmonic, median, mode quartiles, deciles, modes, relative and absolute dispersion, sample space and events as sets. Finite probability space properties of probability. Statistical independence and conditional probability. Tree diagram. Bayes theorem. Discrete and continuous random variables. Expectation, independent Bernoulli trials. Binomial Poisson and Normal distributions. Normal approximation to binomial and Poisson distribution, Hyper geometric.

MTH 112: Differential Calculus (2 units)

Real number: The number line, intervals, properties of absolute value. Solving inequalities sign chart. Function from IR to IR, domain range, graph, monotonically increasing, decreasing functions. Inverse functions. Composition of functions. Even and odd functions, periodic functions, Limits, convergence sequences. Limit of a function, left and right limits and continuity. Differentiability at a point and on an interval. Sum, product and quotient rule. Chain rule for inverse function. Implicit differential.

MTH 122: Integral Calculus (2 units)

Fundamental theorem of calculus. Integration by parts, change of variable method, integration of rational functions, trigonometric integral, trigonometric substitutions. Numerical integration: Trapezium method.

MTH 142: Vectors and Geometry(2 units)

Equations of lines and planes. Conic sections, circles parabola, hyperbola, ellipse. Vectors in IR^2, IR^3, Scalar products. Vector product Triple products. Application to Geometry.

(Note: Vector approach should be used where necessary)

PHY 124: Geometric and Wave Optics (2 units)

Reflection and Refraction. Review of refractive index and Snell's law, real and apparent depth, total internal reflection, critical angle, methods of measuring refractive index. The air-cell method. The Prism, refraction through prism. Angle of deviation, minimum deviation, principle of reversibility of light ray, small angle prism. Lenses and their construction. Derivations of lens formula and lens. Makers formulas. Virtual objects, magnification. Thin leaves in contact. Newton's formula. Spherical mirrors. The mirror formula, spherical and chromatic aberrations. Eye defects; calculation of powers and focal length of correcting lenses. Dispersion and Spectrometer. Dispersion and dispersive power. The spectrometer, essential parts and adjustments; measurements of refractive index. Spectroscopy, classification of spectra. Applications. Optical instruments. Basic principles, the simple magnifying glass. The compound microscope, the astronomical telescope, the eye ring. Wave Nature of light. Interference of light, optical path, conditions for interference, interference fringes. Young's experiments, Fresnel's bi-prism. Parallel sided thin films, the wedge fringes. Newton's rings. Applications of interference. Polarisation, Malus law, Polaroids

PHY 132: Electricity, Magnetism and Modern Physics (2 units)

Electrostatics – electric charges, forces between electric charges, static electricity, conductors and currents, dielectrics, heating effects of Current-secbeck and Peltic effects with practical applications. Magnetic fields – fields due to a flat Coil, Solenoid and infinitely long straight wire, forces between current-carrying conductors, Ammeters, electrolysis and ion velocities, Voltameters. Practical application of electrolysis, Magnetic induction, Maxwell's equation, electromagnetic oscillations, waves and applications.

PHY 192: Introductory Physics Practical II (2 units)

Selected experiments on topic covered in PHY 131 and PHY 102 with emphasis on application of a variety of simple experimental technique, quantitative measurements, experimental errors and graphical analysis.

CIT 211: Introduction to Operating System (3 units)

Definition of an operating system; Types of operating systems; and real time (single-user/multi-user), timesharing; Examples of operating systems; DOS, CP/M, UNIT/ZENITH,/LINUX, MS/9798/2000, etc. Components of an operating system; Supervisor, memory manager, I/O handlers, file system, etc. Operating system interface with the hardware; interrupts, i/o channel, multiplexer, registers, status words. Operating system interface with other systems software; linkers, translators, libraries, etc. storage organization and protection.

CIT 215: Introduction to Programming (3 units)

FORTRAN programming language; Comparison of various versions of the language. Programming exercises using FORTRAN with emphasis on scientific application problems. Elements of Pascal language. Exercises in Pascal Programme structures and programming concepts; Structured design principles; abstraction, modularity, stepwise refinement, structured design techniques teaching of a structured programming language, e.g. PASCAL/JAVA, C^{++}.

CIT 237: Programming and Algorithms (3 units)

The programme development process, programme design, coding, and testing principles of good programming styles; Programme verification techniques; Programme documentations and maintenance; Programme design tools, e.g. flowcharts, pseudocodes, etc. Illustration of the various concepts with practical programming problems of manageable complexity e.g. Knight's tour or 8-queens, life game problems, etc. Algorithms and data structures; Divide-and-conquer algorithms; Stacks, queues, trees. A treatment of popular sorting and searching algorithms; performance analysis of algorithms. Worst-, best-and average-case performance of the algorithms. Recursion, Hill-climbing techniques.

MTH 211: Introduction to Set theory and Abstract Algebra (3 units)

Set: Binary operations, mapping, equivalence relations integers: Fundamental theorem of arithmetic, congruence equations, Euler's function (n) Group Theory: Definition and examples of groups. Subgroups, coset decomposition, Lagrange's theorem. Cyclic groups. Homomorphism, isomorphism. Odd and even permutations, Cayley's theorem. Rings:

Definition and examples of rings. Commutative rings. Integral domain. Order, well-ordering principles. Mathematical induction.

MTH 241: Introduction to Real Analysis (3 units)

Set: Cartesian products, functions and mappings direct and inverse images. Countable sets. Limits: Elementary properties of limits. Upper and lower bounds, supremum, infimum, convergence of sequences. Limit of monotone functions and sequences. Candy convergence principles. Continuity: Rea-Valued functions of a real variable Monotone functions, periodic functions, bounded functions. Continuity of functions using neighbourhood. Elementary properties of continuous functions. Uniform continuity. Series: convergence of series, tests for convergence, absolute convergence, power series, uniform convergence.

MTH 281: Mathematical Methods I (3 units)

Sequences and Series: Limits, continuity, Differentiability, implicit functions, sequences. Series, test for convergence sequences and series of functions. Calculus: partial differentiation, total derivatives, implicitly functions, change of variables. Taylor's theorem and maxima and minima functions, of two variables. Langrangian multiplier. Numerical Methods: Introduction to iterative methods, Newton's method applied to finding roots. Trapezium and Sipsons rules of integration.

CIT 208: Information systems (2 units)

Introduction & Basic SQL Project Introduction. Advanced SQL. Conceptual Modelling and Schema Design. Database Programming, JDBC, Regular Expressions. Functional Dependencies E2: Functional Dependency & Relational Algebra. Relational Algebra. Introduction to XML. XML and XQuery. Web Services. Transactions. Recovery. Database Heterogeneity.

CIT 212: Systems Analysis & Design (3 units)

General systems concepts: Systems project team organisation; Overview of systems development process; Project identification and selection; system requirements analysis and feasibility study; fact finding techniques; Systems design; Analysis techniques and tools e.g. Jackson System Development (JSD) techniques etc. Data flow diagrams, HIPO charts. Business system design; procurement, site preparation, system installation, system testing, system conversions; system project, report writing, and presentation; system

documentation; post installation evaluation; compilation of a real-life system analysis team project to provide experience in applying the principles and techniques presented above

CIT 236: Analog and Digital Electronics (3units)

Biploar Junction Transistors: Common Emitter biasin, load lines; Small signal Amplifiers: Transistor Hybrid parameters, Analysis of a single stage transistor amplifier small signal operation, Field Effect Transistors, Introduction to feedback, Operational Amplifiers, DC power supplies, Voltage regulators, Heat sinks, Boolean Algebra, Logic gates, Karnaugh Maps

CIT 292: Computer Laboratory I (2 units)

Basic logic Operations. Combinational logic, Karnaugh maps, Simple latch and clocked flip flop, J-k flip-flops, Binary addition, Synchronous counters, up and down counters.

MTH 212: Linear Algebra II (3 units)

Vector spaces. Linear independence. Basis, change of basis and dimension. Linear equations and matrices. Linear maps. The diagonal, permutation, triangular matrices. Elementary matrix. The inverse of a matrix. Rank and nullity. Determinants. Adjoint, cofactors, inverse matrix. Determinantial rank. Crammer's rule. Canonical forms, similar matrices, Eigen values and vectors, quadratic forms.

MTH 232: Elementary Differential Equation (3 units)

Introduction, equation of first order and first degree, separable equations, homogeneous equations, exact equations, linear equations, Bernoulli's and Riccati equations. Applications to mechanics and electricity. Orthogonal and oblique trajectories. Second order equations with constant coefficients.

MTH 282: Mathematical Methods II (3 units)

Vector Theory: Vector and scalar field functions. Grad, div, curl, directional derivatives. Orthogonal curvilinear coordinates.

Complex Numbers: The algebra and geometry of complex numbers; d'Moivre's theorem. Elementary transcendental functions. The n^{th} root of unity and of a general complex number.

CIT 303: Principles of Communication Technology (3 units)

Drives and Sensors: Functionality, calculation, and operational behavior of motors; Functionality and choice of sensors; Drive design and regulation; Decentralized drive systems. Communication and Networks: Functionality and integration of automation components (bus systems, automation devices, communication modules, process control systems); Networked automation technology; Service and monitoring systems, Human Machine Interface; Planning and the basic principles of project planning with *Profinet* / industrial Ethernet-based networks. Safety Engineering in Automation Technology: Project planning for an error-proof automation system; Error-proof communication and programming; Remote diagnostics, elimination of errors, and remote maintenance. Automated Systems: Integral development methodology in automation; Economic development (planning, budgeting); Application examples.

CIT 305: Networking and Communication Technology (3 units)

Introduction; Constructing data links, Deploying physical media; Practical network protocols; Capitalizing on Ethernet; Harnessing Wi-Fi for user mobility; Building internetworks using TCP/IP and routers; Utilizing telecommunication circuits; Implementing security best practices; Creating enterprise networks; Planning and selection. Protocols, technologies, standards, and applications of data communications and computer networks for both LANs and WANs. Foundation and background of Advanced WAN and LAN classes. Signal transmission analysis, modulation concepts, modems, multiplexers, digital technologies, transmission impairments, and various transmission media will be extensively discussed. Network protocols based on the OSI Reference Model, TCP/IP protocol suite, and IEEE 802 standards. Network technologies: ISDN, DSL, SONET, packet switching networks, LAN technologies, Internet and TCP/IP, and ATM

CIT 309: Computer Architecture (3 units)

Introduction, basic computer organization; Instruction formats, instruction sets and their design; ALU design: Adders, subtracters, logic operations; Boolean Algebra; Karnaugh Maps; Datapath design; Control design: Hardwired control, microprogrammed control; More on arithmetic: Multiplication, division, floating point arithmetic; RISC machines; Pipelining; Memory systems and error detection and error correction coding; Caches; Memory; I/O and Storage; Multiple Issue; Dynamic Scheduling; Data-Level Parallelism and Vectors; Shared-Memory; Multiprocessors; Multithreading

CIT 311: Computer Networks (3 units)

Networks, The Topologies, characteristics of the OSI Layer OSI Models and Communication between systems, Interaction between OSI Model layers, protocols types of Network : Local Area Network (LAN) Metropolitan Network (MAN): Wide Area Network (WAN). Medium Dataflow, physical connection, Transmission Media connecting devices repeaters, Hubs, Bridges Routers Gateway

CIT 341: Data Structures (3 units)

Basic data structure including lists and trees, constructs for specifying and manipulating data types. List structures, Binary, AVL and other trees, traversal algorithm, graphs, rings, recursive programming, storage managements; stacks, queues, language features affecting static and dynamic data structures, fixed and variable sized blocks, best-fit, first-fit, etc. garbage collection, fragmentation, buddy system, block compaction and relocation hash tables, programming exercises involving the implementation and use of data structures.

CIT 371: Introduction to Computer Graphics & Animations (3 units)

Mathematics of 3-Ds and projections; graphical data structures; characteristics, and types of display memories; graphics hardware including digital plotters and display devices; graphics, software;

CIT 381: File Processing and Management (3 units)

Review of basic, file processing concepts; the file management concepts; basic terminology and concepts; structure of file management systems; Data flow between systems; Data flow between systems; Data flow between internal memory and external storage; blocking and deblocking; files; searching and sorting techniques, merging; relevant i/o facilities for files processing of some high level programming languages such as FORTRAN, COBOL, PASCAL, etc; file organization methods; sequential indexed, direct/random, etc; Data validation; report generation, file management packages; file

management security and integrity; assignment and completion of a data processing project Structures.

DAM 301: Data Mining and Data Warehousing (3 units)

Data Mining; Definition relationship to warehousing Classification of data mining approaches to data mining problems application of data mining , commercial tools of data mining, knowledge discovery, Architecture of Data warehousing Data marts, Data warehousing lifecycle, data modelling Building of data warehouse, OLAP, MOLAP, ROLAP Data warehouse and views. Future open issue for data warehouse.

CIT 322: Introduction to Internet Programming (3 units)

Introduction to current programming models in generating and supporting rich real-world web based applications. Internet architecture and organization. Internet services, electronic mail, data transfer, dial-up, connection protocols. Connection to Internet: modem connection, dial-up servers. Modern protocols for multimedia communication: Common Gateway Interface (CGI), multimedia messaging, protocols for multimedia communication – hypertext. HTML programming language: HTML tags and concepts such as tables, frames, forms and cascading style sheets; hypertext design. Web services and servers, examples and design of web pages, search engines and indexing. Elements of programming language: JavaScript, dynamic HTML pages. Development and the future communication using Internet. New technologies.

CIT 342: Formal Languages and Automata Theory (3 units)

Introduction to language structures; languages and their representations; Grammars; formal notations, types, Chomsky's language hierarchy; sentence generation and recognition; derivations; Ambiguity and syntax and finite state automata; context-free grammars; simplification of context-free grammars; Chomsky, Greibach Normal Forms Push-Down automata, LR(K), grammars, Recursive languages; semantics. Lab. exercises.

CIT 344: Introduction to Computer Design (3 units)

Introduction to numbers and codes. Combinational logic design and applications: adders, decoders, multiplexers, etc. Sequential logic design and applications: registers, flip-flops, etc., and general finite state machines. Memory devices: read-only memory (ROM),

random access memory (RAM). Introduction to microprocessors: arithmetic logic unit (ALU), basic CPU architecture, addressing modes and program execution. Assembly language programming: programs for simple tasks; branching, loops, and subroutines.

CIT 389: Industrial Training (3 units)

Required 3 months of Industrial Training Students experiences will be documented and presented in a Seminar and submitted as a Tutor Marked Assignment. An example of a report is a report of a case study of a Cyber Cafe.

CIT 392: Computer Laboratory II (2 units)

Laboratory exercises using the programming language Laboratory exercises using a microcomputer operating system, e.g. MS-97/98/2000 Laboratory exercises using relevant programming languages such as C and C^{++}. Submission of a group project report of case study of a computer centre. Laboratory Exercises in COBOL, ADA, and SQL.

DAM 344: Semantic Data Modelling (2 units)

Concepts of Data Modelling: Overview of Data Modelling, Data Modelling concepts, Data models Semantic Data Modelling: Overview of Semantic Data Modelling, Semantic Data Models Semantic Data Modelling Concepts, Areas of Application of Semantic Data Modelling Application in Computer, Application in Business

DAM364 Management Information Systems (2 units)

Introduction to MIS, Types of MIS, Levels of Management, Overview of Information Technology, Technologies for Information System, Internets, Modes of Information Communication, Information Representation-, Information Storage Media, Information Security.

DAM382 Information Systems Management (3 units)

CIT 403: Emerging Technologies (3 units)

Learners are to carry out researches and write Term papers on the Current/Emerging technologies in Information and Communication Technology

CIT 411: Microcomputers and Microprocessors (2 units)

Review of basic concepts in digital electronic; Microprocessors; functions, operations and architecture; comparison of current microprocessors; multi-chip and single chip; i/o organization; assembler language; comparison of instruction sets; address modes, stack operation; subroutines. i/o data transfer; bus control; daisy chaining, handshaking etc; Interrupt structures; programmed transfer, DMA microcomputer systems; types of microprocessors; uses of microprocessors, microcomputer design for specific applications; microcomputer networking; interfacing microcomputer real-time control; laboratory exercises using an assembly language

CIT 415: Introduction to E-Commerce (3 units)

Introduction of basic concepts and definitions; Techniques and methodologies for for developing and managing Web-sites for e-Commerce. Topics include: Introducing pre-requisite skills, understanding Electronic business and electronic commerce, Techniques and methodology for site development, Developing and enhancing a Product Catalogue, Managing a Shopping Cart, Processing orders, Completing the Purchasing process and Tracking Shoppers Information.

CIT 421: Information Theory and Computer Communications System (3 units)

Historical background of information theory models or computation systems, coding theory. Information and encoding, basic concepts of interactive computing, interactive terminals devices protocols, direct links, communication channels, telecommunications links, simplex, half duplex, duplex, multiplex, concentrators, computer networks operating system for online processing routing algorithms, response, time reliability and security.

CIT 427: Database Systems & Management (3 units)

Basic concept of data bases, history of DBMS types of database, specific problems of data independence, data reliability, integrity, etc, data, data management, data base generation, raw data, data definitions, data structure, storage structure data base logical and physical organization, interrogation, data model, network, hierarchical relational, security, policies, privacy quality and integrity protection mechanism.

CIT 445: Principles and Techniques of Compliers (3 units)

Recapitulation of formal grammars; source code and target code structure of typical compiler, comparative compiling techniques. Lexical analysis syntax analysis; simple precedence, operator precedence, LR(K) parsers; semantics, Runt time storage allocation code generation and code optimization. Compiler-compilers. Pragmatics of Compiler

writing: Translator writing Error recovery and Optimization problems; Laboratory exercises leading to the productions of major parts of a compiler for an actual programming language.

CIT 461 Internet Architecture & Communications (3 units)

History of the Internet. Internet protocols (IP, FTP, HTTP, TCP). Network topologies. Renters. Bridges. Gate ways. Backbones. World wide web (www). TTP Sites and examples. Internet Browsers (Internet explorer, Netscape). Role of ISP's Internet Connectivity Requirements. E-mail, E-Business. Website design and Hosting. Engines.

CIT 463: Introduction to Multimedia Technology (3 units)

Introduction: What is multimedia, Multimedia systems, Quality of service, Synchronization & orchestration, Standards, Convergence, Value chain. Hardware: Multimedia computers, Video and graphics, Audio, Telephone, video conference, and networks, CD and DVD, USB and FireWire, Processors, Video for Windows, DirectX, and ActiveMovie. Software: Browser based software architecture, Distributed software, Servers, Network, Terminals. Audio and Video: Digital audio; Psycho acoustics, Digital presentation of sound, Digital images, JPEG, Video signal, Camera sensors, Colors, Color television, Equipment, Compression systems, Basics of video compression, Methods, Algorithms. Interchange Formats: Application areas, Requirements, Track and object model, Real-time transfer, Different transfer formats, Comparison. Authoring Tools: Production process, Tools, Barriers, Development areas. Communications: QoS, ATM, QoS implementations, Integrated Services, Differentiated Services. Multicast: Group control, Routing, Real-time transfer and control protocols, Resource reservation, Session control, MBone. Video Conference: Standards, Products, Internet telephony, CTI (Computer Telephony Integration). Access Networks: Cable television, Digital subscriber lines, UMTS, Digital television.

CIT 465: Network Administration (2 units)

Introduction to Network Administration: scope, goals, philosophy & standards. IT System Components and Network Structures, technology and protocols. System Administration: host computer and user management. Network Administration methods and Standards. Managing devices using SNMP and RMON. Management issues: planning, implementation, fault diagnosis and recovery. Network Simulation as a management tool. Network Documentation. Network Security and Administration.

CIT 469: Protocols Design and Programming (2 units)

Introduction: Stages in Protocols design: Problem definition, requirements analysis, protocol design and implementation in software. Protocol design tools. Overhead: bandwidth, CPU, etc. Protocol life cycle. Preparing for future versions of the protocol: version numbers, reserved bit fields, forwards and backwards compatibility. Parameters setting. Desirable protocol features: auto-configuration, robustness (simple, self-stabilization and Byzantine robustness. Documentation and standardization. Planning an upgrade path for future versions. Mobility. Ubiquitous computing. Comprehensive security: Nano-computing, bio-computing.

CIT 422: Techniques in Data Analysis (3 units)

CIT 425: Operations Research (3 units)

Simple theories of queues, stochastic processes and random numbers, definition and uses of simulation; discrete simulation models, design of simulation experiments; simulation langs, detailed study of a chosen simulation language; applications; Lab. exercises. The nature of operation research; allocation problems; inventory problems; Replacement; maintenance and reliability problems. Dynamic programming; sequencing and co-ordination.

CIT 474: Introduction to Expert Systems (2 units)

Study of different classes of expert systems, e.g. Rule Based: MYCIN or PROSPECTOR, Blackboard; HEARSAY or CRYSLIS, Expert System shells e.g. Rule Based: e.g. P-MYCIN, EXPERT. S.I. Frame Based e.g. KEE, KL-ONE Merit and Demerits of natural language interface for expert systems. Extensive independent study of recent development in the field and the submission of a group proposal for the application of Expert System in different areas.

CIT 478: Artificial Intelligence (2 units)

Basic AI issues attention, Search, Control, Game trees, knowledge representation, Application of AI techniques in natural language, scene analysis, expert systems, KBCS robot planning. Lab. exercises in AI lang. e.g., LISP/Prolog.

CIT 484: Website Design & Programming (2 units)

What is HTML; Basic Tags of HTML; HTML Tag TITLE Tag Body Tag Formatting of Text, Headers, Formatting Tags, Pre-Tag FONT TAG Special Characters Working with

Images META Tag; Links: Anchor Tag, Lists; unordered lists ordered lists, definition lists, tables : TABLE, TR and TD Tags Cell spacing and cell padding colspan and Rowspan Frames: Frameset frame Tag, NOFRAMES Tag Forms: FORM and INPUT Tag,; Text Box Radio Button, checkbox. Select tag and pull down. Lists hidden submit and Reset. Some special Tags: COLGROUP, THREAD, TBODY, TFOOT, blank self, parent top, IFRAME LABEL TEXTAREA. INTRODUCTION TO Java Script: Java script variables and data types. Statement and operators, control structures object based programming message box in JavaScript, Javascript with HTML forms

CIT 499: Project (4 units)

Individual or Group projects of approved topics related to the current research interests in the department.

DAM 461: Statistical Database System (2 units)

Fundamentals of Database Systems: Databases and Database Users, Database System Concepts and Architecture, Data Modelling Using the Entity-Relationship Model.The Statistical database system, Statistical Database Concepts, Statistical Data Analysis, Mining and Decision Tree Computer Security and Statistical Databases Application of Statistical Database System SPEA SMART Airport Statistical Data Management System (SMART STAT)

CIT 499: Projects

Individual or Group projects of approved topics related to the current research interests in the department.

Outline of Course Structure: The B. Sc., Honours, Computer Science

100 Level

Course Code	Course Titles	Unit(s)	Status
1st Semester			
GST 101	Use of English and Communication Skill I	2	C

GST 107	The Good Study Guide	2	C
BIO101	General Biology	2	C
CHM101	Introductory Inorganic Chemistry	2	C
CIT 101	Computers in Society	2	C
CIT 143	Introduction to Data Organisation and Management	2	C
MTH 121	Linear Algebra I	2	C
PHY 111	Elementary Mechanics	2	C
PHY 113	Heat and Properties of Matter	2	C
PHY 191	Introductory Practical Physics I	2	C
	Total Compulsory Units	**20**	
	Total Elective Units	**0**	
	Total Credit Units	**20**	
2nd Semester			
GST 102	Use of English and Communication Skills II	2	C
GST 105	History and Philosophy of Science	2	C
GST 122	Introduction to Philosophy and Logic	2	C
CIT 102	Software Application Skills	2	C
CIT 132	Programming in BASIC	2	C
MTH 102	Introductory Statistics	2	C
MTH 112	Differential Calculus	2	C
MTH 122	Integral Calculus	2	C
MTH 142	Vectors and Geometry	2	C
PHY 132	Electricity, Magnetism and Modern Physics	2	C
PHY 192	Introductory Practical Physics II	2	C

	Total Compulsory Units	**22**	
	Total Elective Units	**0**	
	Total Credit Units	**22**	

200 Level

Course Code	**Course Titles**	**Unit(s)**	**Status**
1st Semester			
GST 201	Nigerian Peoples and Cultures	2	C
CIT 211	Introduction to Operating Systems	3	C
CIT 213	Elementary Data Processing	2	E
CIT 215	Introduction to Programming Languages	3	C
CIT 237	Programming & Algorithms	3	C
MTH 211	Introduction to Set Theory and Abstract Algebra	3	E
MTH 213	Numerical Analysis I	3	C
MTH 241	Introduction to Real Analysis	3	E
MTH 281	Mathematical Methods I	3	C
	Total Compulsory Units	**17**	
	Total Elective Units	**8**	
	Total Credit Units	**25**	
	**** Students are expected to offer at least one elective course per semester. Also they can only register a maximum of 25 units per semester***		

2nd Semester			
CIT 208	Information Systems	2	C
CIT 212	Systems Analysis and Design	3	C
CIT 246	Introduction to Computer Organisation	2	C
CIT 292	Computer Laboratory I	2	C
MTH 212	Linear Algebra II	3	E
MTH 232	Elementary Differential Equation	3	E
MTH 282	Mathematical Methods II	3	C
STT 211	Probability Distribution I	3	E
	Total Compulsory Units	**12**	
	Total Elective Units	**9**	
	Total Credit Units	**21**	
	**** Students are expected to offer at least one elective course per semester. Also they can only register a maximum of 25 units per semester***		

300 Level

Course Code	**Course Titles**	**Unit(s)**	**Status**
1st Semester			
CIT 309	Computer Architecture	3	C
CIT 311	Computer Networks	3	C
CIT 331	Theory of Computation	2	E
CIT 333	Software Engineering I	2	C

CIT 341	Data Structures	3	C
CIT 351	C# Programming	2	C
CIT 353	Introduction to Human-Computer Interaction	2	E
CIT361	Data Communication	2	E
CIT 371	Introduction to Computer Graphics and Animations	3	E
CIT 383	Introduction to Object-Oriented Programming	2	E
MTH 307	Numerical Analysis II	3	C
MTH 381	Mathematical Methods III	3	E
STT 311	Probability Distribution II	3	E
	Total Compulsory Units	**18**	
	Total Elective Units	**21**	
	Total Credit Units	**39**	
	**** Students are expected to offer at least one elective course per semester. Also they can only register a maximum of 25 units per semester***		
2nd Semester			
CIT 322	Introduction to Internet Programming	3	E
CIT 342	Formal Languages and Automata theory	3	C
CIT 344	Introduction to Computer Design	3	C
CIT 381	File Processing and Management	2	C
CIT 389	Industrial Training	3	C
CIT 392	Computer Laboratory II	2	C
MTH 382	Mathematical Methods IV	3	E
	Total Compulsory Units	**15**	
	Total Elective Units	**6**	

	Total Credit Units	**21**	
	**** Students are expected to offer at least one elective course per semester. Also they can only register a maximum of 25 units per semester***		

400 Level

Course Code	**Course Titles**	**Unit(s)**	**Status**
1st Semester			
CIT 403	Emerging Technologies	3	C
CIT 411	Microcomputers and Microprocessors	2	C
CIT 425	Operations Research	3	E
CIT 427	Database Systems and Management	3	C
CIT 445	Principles and Techniques of Compilers	3	C
CIT 461	Internet Architecture and Communication	3	E
CIT 463	Introduction to Multimedia Technology	3	E
CIT 465	Network Administration	2	E
CIT 467	Visual Programming and Applications	3	E
	Total Compulsory Units	**11**	
	Total Elective Units	**14**	
	Total Credit Units	**25**	
	**** Students are expected to offer at least one elective course per semester. Also they can only register a maximum of 25 units per semester***		
2nd Semester			
CIT 412	Modelling and Simulation	3	C

CIT 432	Software Engineering II	3	E
CIT 474	Introduction to Expert Systems	2	E
CIT 478	Artificial intelligence	2	C
CIT 484	Website Design and Programming	2	C
CIT 499	Project	4	C
	Total Compulsory Units	**11**	
	Total Elective Units	**5**	
	Total Credit Units	**16**	
	**** Students are expected to offer at least one elective course per semester. Also they can only register a maximum of 25 units per semester***		

N/B: B.Sc (Computer Science Students) Students must accumulate a minimum of 120 credit units to graduate.

4.3 Course Content Specification: For graduation with a B.Sc.(Hons.) in Computer Science, the students must have a minimum of 140 credit units of core courses and 12 units of elective courses for an 8 semester structure and 110 credit units of core courses and 10 units of elective courses for a 6 semester structure.

Find below the course descriptions:

GST 101 Use of English and Communication Skills I

Listening- enabling skills, listening and comprehending, note taking and information retrieval. Including data, figures, diagrams and charts, Listening for main idea, interpretation and critical evaluation. Effective reading, skimming and scanning. Reading and comprehension at various speed levels. Vocabulary development in various academic context. Reading diverse texts in narratives and expository. Reading and comprehension passges with tables, scientific texts. Reading for interpretation and critical evaluation.

GST 102 Use of English and Communication Skills II

Writing paragraphs: Topic sentence and coherence. Development of paragraphs: illustration, description, cause and effect including definitions. Formal letters: essential parts and stylistic forms; complains and requests; jobs, ordering goods, letters to government and other organisations. Writing reports; reporting event, experiments. Writing summaries; techniques of summarising letters and sounds in English, vowels and consonants. Interviews, seminar presentation, public speech making, articles, concord and sentences including tenses. Gerund, participles, active, passive and the infinitive. Modal auxiliaries.

GST 105: History and Philosophy of Science (2 units)

Nature of science, scientific methods and theories; Law of nature,; History of science. Lost sciences of Africa, science, technology and inventions. Nature and scope of philosophy in science. Man, nature and his origin. Man , environment and resources. Great Nigerian Scientists.

GST 107 The Good Study Guide

Getting started: How to use the book, why read about skills, getting yourself organised ; what is studying all about, reading and note taking; Introduction, reactions to reading, your reading strategy, memory, taking notes, conclusion. Other ways of studying: Introduction, learning in groups, talks and lectures, learning from TV and radio broadcasts, other study media. Working with numbers; Getting to know numbers, describing the world, describing with the tables, describing with diagrams and graphs; What is good writing? The Importance of writing, what does an essay look like, what is a good essay? Conclusion. How

to write essays: Introduction, the craft of writing, the advantages of treating essay writing as a craft, making your essay flow, making a convincing case, the experience of writing. Preparing for examination.

CIT 101: Computers in Society

What is Computer, Types of Computer, History of Digital Computer, Element of a Computer : Hardware and Software. How to work with a computer. Operating System Windows Files word processing, copying a text, saving, Changes to a document and Formatting, spelling checker and introduction to Printing a document. Spread sheet, Entering and correcting data. Using Formula, Numeric Formats Creating Charts. Types of Charts Power Points and presentation. Networking, Internet and E-mail. Reading and responding to an E-mail message.

CIT 102: Software Application Skills

Brief description of computer system: CPU, I/O devices; Operating systems; Computer File Management; Computer Software: overview, types, etc.; Application software: common application software; Using Microsoft Word; Using Microsoft Excel; Features of Database Applications and Microsoft Access; Statistical Analysis Applications; Using SPSS software; Introduction to Desktop Publishing applications; Computer applications in Nursing; Computer applications in Agriculture; Managing the computer system with the Control Panel.

CIT 132: Programming in BASIC (2 units)

Introduction to programming: Problem Solving Concepts, Flowcharting, and Programming Languages; Fundamental Concepts and Language Structure: statement structure, The BASIC Character Set, Predefined Functions; Solving simple problems with BASIC: BASIC statements – END, PRINT, LET, READ, DATA, RESTORE, INPUT, GOTO, IF-THEN, ON-GOTO, FOR-NEXT, STEP, DIM, GOSUB, RETURN, etc. Loops, Arrays, and Nested Loops, Constants, Variables, and Arithmetic Operations; Using predefined functions, Defining your own functions; Constructing and using subroutines; Formatting printed output: PRINT, TAB, PRINT USING, and Format statements; Storing and retrieving programs and data

MTH 102: Introductory Statistics

Measures of central tendency and dispersion, (grouped and ungrouped); mean: - arithmetic and geometric, harmonic, median, mode quartiles, deciles, modes, relative and absolute dispersion, sample space and events as sets. Finite probability space properties of probability. Statistical independence and conditional probability. Tree diagram. Bayes theorem. Discrete and continuous random variables. Expectation, independent Bernoulli trials. Binomial Poisson and Normal distributions. Normal approximation to binomial and Poisson distribution, Hyper geometric.

MTH 133: Trigonometry

Trigonometric functions; Radian measure, law of sine and cosine, sum, differences and product formulas. Trigonometric identities, Inverse trigonometric functions, solutions of Trigonometric equations. Exponential and logarithmic functions, laws of exponents and a logarithm. Algebraic functions, polynomials, division algorithm, synthetic division, factor theorem, remainder theorem. Rational functions, asymptotes partial factions.

MTH 112: Differential Calculus

Real number: The number line, intervals, properties of absolute value. Solving inequalities sign chart. Function from IR to IR, domain range, graph, monotonically increasing, decreasing functions. Inverse functions. Composition of functions. Even and odd functions, periodic functions, Limits, convergence sequences. Limit of a function, left and right limits and continuity. Differentiability at a point and on an interval. Sum, product and quotient rule. Chain rule for inverse function. Implicit differential.

MTH 121: Linear Algebra I

Definition of a matrix and types of matrices; Equality of matrices; transpose of a matrix; Hermittan matrix; Skew Hermittan; matrix Algebra: Properties of matrix addition; Scalar multiplication; matrix multiplication. Linear equations; linear equation in two unknowns; General systems of linear equations. Determinants: Determinants of 2 x 2 matrix; Determinants of 3 x 3 matrix: properties of determinants; Inverse of matrices; Inverse of a square matrix; Inverse of a non-singular 2 x 2 matrix; Inverse of a 3 x 3 square matrices; Invertible matrices and Determinants; Row Echelon form and system of equations; solving systems of equation by row, Reduced Echelon form; Determinant and systems of equations; Transformation of the plane; some properties of transformation: Vector spaces; Definitions; subpacks, ranks of a matrix; linear dependence; Basis of vector; Wronkian of functions.

MTH 122: Integral Calculus (2 Units)

Fundamental theorem of calculus. Integration by parts, change of variable method, integration of rational functions, trigonometric integral, trigonometric substitutions. Numerical integration: Trapezium method.

MTH 142: Vectors and Geometry

Equations of lines and planes. Conic sections, circles parabola, hyperbola, ellipse. Vectors in IR^2, IR^3, Scalar products. Vector product Triple products. Application to Geometry. The notion of displacement, speed, velocity and acceleration of a particles. Newton's law of notions and applications to simple problems. Work, power, and energy. Application of the principle of conservation of energy to notion of

particles and those involving elastic string and springs. Simple Harmonic motion. Resultant of any number of forces acting on a particles. Reduction of coplanar forces acting on a rigid body to a force and a couple. Equilibrium of coplanar forces, parallel forces, couples. Laws of friction. Application of the principle of moments. Moment of Inertia of simple bodies. ***(Note: Vector approach should be used where necessary)***

PHY 111: Elementary Mechanics (2 Units)

Physical quantities, unit and dimensions space and time, frames of reference, vestures and scalars, kinematics – straight line, line motion, vertical motion, circular motion, deviation. Dynamics – Equilibrium, work and energy, mass and momentum, laws of inertia, rotational motion, simple harmonic motion, conservation laws, simple machines, fundamental laws of statics and dynamics, Galilean invariance.

PHY 122: Heat and Properties of Matter (2 Unit(s))

Heat and temperature, work and heat, heat capacities, thermal expansion of solids, liquids and gases, latent heat, gas laws, heat transfer, isothermal and adiabatic changes, laws of thermo dynamics. Simple kinetic theory of gases the van der Waals gas. Basic concepts and properties of waves; types of waves, wave nature of light. Classification of matter into (solids, liquids and gases, forces between atoms and molecules, molecular theory of matter, elasticity, plasticity, Hook's Law, Young's Shear and bulk Moduli) Crystalline and non-crystalline materials, Hydro-dynamics-streamlines, Bernouli and continuity equations, turbulence, Reynold's number, Viscosity, laminar flow, Poisenille's equation, surface tension, adhesion, cohesion, capillary, drops and bubbles.

PHY 124: Geometrics and Wave Optics

Reflection and Refraction. Review of refractive index and Snell's law, real and apparent depth, Total Credit Units internal reflection, critical angle, methods of measuring refractive index. The air-cell method. The Prism, refraction through prism. Angle of deviation, minimum deviation, principle of reversibility of light ray, small angle prism. Lenses and their construction. Derivations of lens formula and lens. Makers formulea. Virtual objects, magnification. Thin leaves in contact. Newtons formula. Spherical mirrors. The mirror formula, spherical and chromatic aberrations. Eye defects; calculation of powers and focal length of correcting lenses. Dispersion and Spectrometer. Dispersion and dispersive power. The spectrometer, essential parts and adjustments; measurements of refractive index. Spectroscopy, classification of spectra. Applications. Optical instruments. Basic principles, the simple magnifying glass. The compound microscope, the astronomical telescope, the eye ring. Wave Nature of light. Interference of light, optical path, conditions for interference, interference fringes. Young's experiments, Fresnel's biprism. Parallel sided thin films, the wedge fringes. Newton's rings. Applications of interference. Polarisation, Malus law, Polaroids

PHY 132: Electricity, Magnetism and Modern Physics (2 Unit(s))

Electrostatics – electric charges, forces between electric charges, static electricity, conductors and currents, dielectrics, heating effects of Current-secbeck and Peltic effects with practical applications. Magnetic fields – fields due to a flat Coil, Solenoid and infitely long straight wire, forces between current-carrying conductors, Ammeters, electrolysis and ion velocities, voltameters. Practical application of electrolysis, Magnetic induction, Maxwell's equation, electromagnetic oscillations, waves and applications.

PHY 191: Introductory Practical Physics I (2 Units)

Selected experiments on topics covered in PHY 111 and PHY 122, Application of a variety of simple experimental techniques with emphasis on quantitative measurements, experimental errors and graphical analysis.

PHY 192: Introductory Practical Physics II (2 Units)

Selected experiments on topics covered in PHY 131 and PHY 102 with emphasis on application of a variety of simple experimental technique, quantitative measurements, experimental errors and graphical analysis.

CIT 208: Information systems

Introduction & Basic SQL Project Introduction. Advanced SQL. Conceptual Modelling and Schema Design. Database Programming, JDBC, Regular Expressions. Functional Dependencies E2: Functional Dependency & Relational Algebra. Relational Algebra. Introduction to XML. XML and XQuery. Web Services. Transactions. Recovery. Database Heterogeneity.

CIT 211: Introduction to Operating System

Definition of an operating system; Types of operating systems; and real time (single-user/multi-user), timesharing; Examples of operating systems; DOS, CP/M, UNIX/ZENIX,/LINUX, MS Windows 95/98/2000, etc. Components of an operating system; Process Management; Supervisor, memory manager, I/O handlers, file system, etc. Operating system interface with the hardware; interrupts, deadlocks, I/O channel, multiplexer, registers, status words; Memory Management; Virtual Memory. Operating system interface with other systems software; linkers, translators, libraries, etc. storage organization and protection.

CIT 212: Systems Analysis & Design

General systems concepts: Systems project team organisation; Overview of systems development process; Project identification and selection; system requirements analysis and feasibility study; fact finding

techniques; Systems design; Analysis techniques and tools e.g. Jackson System Development (JSD) techniques etc. Data flow diagrams (DFD), HIPO charts. Business system design; procurement, site preparation, system installation, system testing, system conversions; system project, report writing, and presentation; system documentation; post installation evaluation; compilation of a real-life system analysis team project to provide experience in applying the principles and techniques presented above.

CIT 213: Elementary Data Processing

Basic EDP concepts: Files, Records, Blocks, Basic File Organization, Devices and concepts: Magnetic Tapes and Storage density. Magnetic Disks: Seek Time and Rotational Latency, Sequential and Random File Processing. Business Programming in COBOL, ADA, SQL

CIT 215: Introduction to Programming Languages

FORTRAN programming language; Comparison of various versions of the language. Programming exercises using FORTRAN with emphasis on scientific application problems. Elements of Pascal language. Exercises in Pascal Program structures and programming concepts; Structured design principles; abstraction, modularity, stepwise refinement, structured design techniques teaching of a structured programming language, e.g. PASCA/JAVA, C^{++}.

CIT 237: Programming and Algorithms

The programme development process, programme design, coding, and testing principles of good programming styles; Programme verification techniques; Programme documentations and maintenance; Programme design tools, e.g. flowcharts, pseudocodes, etc. Illustration of the various concepts with practical programming problems of manageable complexity e.g. Knight's tour or 8-queens, life game problems, etc. Algorithms and data structures; Divide-and-conquer algorithms; Stacks, queues, trees. A treatment of popular sorting and searching algorithms; performance analysis of algorithms. Worst-, best- and average-case performance of the algorithms. Recursion, Hill-climbing techniques.

CIT 246: Introduction to Computer Organi2ation

Number systems; Number representation; Computer arithmetic; Basic instruction cycle; Data types; Instruction types; Addressing modes; Assemblers, linkers, loader; Subroutines, stacks; I/O, traps, interrupts; Floating-point instructions; Instruction set design; Virtual machines, compilation/interpretation

CIT 292: Computer Laboratory 1

Basic logic Operations. Combinational logic, Karnaugh maps, Simple latch and clocked flip flop, J-k flip-flops, Binary addition, Synchronous counters, up and down counters.

MTH 211: Introduction to Set theory and Abstract Algebra

Set: Binary operations, mapping, equivalence relations integers: Fundamental theorem of arithmetic, congruence equations, Euler's function (n) Group Theory: Definition and examples of groups. Subgroups, coset decomposition, Lagrange's theorem. Cyclic groups. Homonorphisms, isomorphism. Odd and even permutations, Cayley's theorem. Rings: Definition and examples of rings. Commutative rings. Integral domain. Order, well-ordering principles. Mathematical induction.

MTH 212: Linear Algebra II

Vector spaces. Linear independence. Basis, change of basis and dimension. Linear equations and matrices. Linear maps. The diagonal, permutation, triangular matrices. Elementary matrix. The inverse of a matrix. Rank and nullity. Determinants. Adjoint, cofactors, inverse matric. Determinantial rank. Crammer's rule. Canonical forms, similar matrics, Eigen values and vectors, quadratic forms.

MTH 213: Numerical Analysis I

Interpolation: Lagrange's and Hermite interpolation formulae, divided differences and difference schemes. Interpolation formulas by use of divided differences. Approximation: Least-square polynomial approximation, chebychev polynomials continued fraction and rational fraction orthogonal polynomials.

Numerical Integration: Newton's-cotes formulae, Gaussian Quadrature. Solution of Equations: Graeffe's method. Bernoulli's method, Newton's method, Bairstow's method (iterative method) Matrices and Related Topics: Definitions, Eigenvalue and Eigenvectors, Algebraic Eigenvalue problems-power method, Jacobi method. Systems of linear Equations: Gauss elimination, Gauss-Jordan method. Jacobi iterative method, Gauss-field iterative method.

MTH 232: Elementary Differential Equation

Introduction, equation of first order and first degree, separable equations, homogeneous equations, exact equations, linear equations, Bernoulli's and Riccati equations. Applications to mechanics and electricity. Orthogonal and oblique trajectories. Second order equations with constant coefficients.

MTH 241: Introduction to Real Analysis

Set: Cartesian products, functions and mappings direct and inverse images. Countable sets. Limits: Elementary properties of limits. Upper and lower bounds, supremum, infimum, convergence of sequences. Limit of monotone functions and sequences. Candy convergence principles. Continuity: Real-Valued functions of a real variable Monotone functions, periodic functions, bounded functions. Continuity of functions using neighbourhood. Elementary properties of continuous functions. Uniform continuity. Series: convergence of series, tests for convergence, absolute convergence, power series, uniform convergence.

MTH 281: Mathematical Methods I

Sequences and Series: Limits, continuity, Differentiability, implicit functions, sequences. Series, test for convergence sequences and series of functions. Calculus: partial differentiation, Total Credit Units derivatives, implicitly functions, change of variables. Taylor's theorem and maxima and minima functions, of two variables. Langrangian multiplier. Numerical Methods: Introduction to iterative methods, Newton's method applied to finding roots. Trapezium and Simpsons rules of integration.

MTH 282: Mathematical Methods II

Vector Theory: Vector and scalar field functions. Grad, div, curl, directional derivatives. Orthogonal curvilinear coordinates.

Complex Numbers: The algebra and geometry of complex numbers; de'moivre's theorem. Elementary transcendental functions. The n^{th} root of unity and of a general complex number.

STT 211: Probability Distribution I

Discrete sample spaces: Algebra and probability of events, combinatorial analysis. Sampling with and without replacement. Conditional probability, Bayes theorem and stochastic independence. Discrete distributions: Binomial, Poisson, negative binomial-hyper geometric and multinomial. Normal approximation to binomial and Poisson, Poisson approximation to binomial. Random variables and expectations: mean, variance, covariance. Probability generating function and moment generating function. Chebychev's inequality. Continuous joint distributions: marjind as conditional density. Expectations**:** movement**,** movement generating functions. Uniform, normal, beta Cauchy and hop-normal distributions.

CIT 309: Computer Architecture

Introduction, basic computer organization; Instruction formats, instruction sets and their design; ALU design: Adders, subtracters, logic operations; Boolean Algebra; Karnaugh Maps; Datapath design; Control design: Hardwired control, microprogrammed control; More on arithmetic: Multiplication, division, floating point arithmetic; RISC machines; Pipelining; Memory systems and error detection and error

correction coding; Caches; Memory; I/O and Storage; Multiple Issue; Dynamic Scheduling; Data-Level Parallelism and Vectors; Shared-Memory; Multiprocessors; Multithreading

CIT 311: Computer Networks

Basic models of communication; data communication and networks; protocols and their basic architecture; idea for standardization; transfer of data; tools and mediums for transfer; data coding; data communication interfaces; control of data connections; multiplexing; local area networks; technology, architecture and systems; wide area networks; types of communication; integrated digital services; internetworking communication; network level; basics of OSI and Internet architecture and reference models; Internet protocols; traffic control; Types of network protocols; transport protocols; application level; system aspects network security; distributed applications; basic network services; network management; OSI and Internet models for management; definition of system servers: from addresses and names to services.

CIT 322: Introduction to Internet Programming

Introduction to current programming models in generating and supporting rich real-world web based applications. Internet architecture and organization. Internet services, electronic mail, data transfer, dial-up, connection protocols. Connection to Internet: modem connection, dial-up servers. Modern protocols for multimedia communication: Common Gateway Interface (CGI), multimedia messaging, protocols for multimedia communication – hypertext. HTML programming language: HTML tags and concepts such as tables, frames, forms and cascading style sheets; hypertext design. Web services and servers, examples and design of web pages, search engines and indexing. Elements of programming language: JavaScript, dynamic HTML pages. Development and the future communication using Internet. New technologies.

CIT 331: Theory of Computation

Finite Automata, Turning machine, Recursively enumerable sets, Halting Problem. Computability and Decidability. Predicate Logic Validity Problem, Deduction, Herband's procedures, Robinson's resolution rule. Programme Verification; Formal Semantics.

CIT 333: Software Engineering I

Top-DOWN design, modularity, technical and managerial problem of software development design representations; e.g. pseudo code HIPO diagrams CASE tools and Programming Environments.

CIT 341: Data Structures

Basic data structure including lists and trees, constructs for specifying and manipulating data types. List structures, Binary, AVL and other trees, traversal algorithm, graphs, rings, recursive programming, storage managements; stacks, queues, language features affecting static and dynamic data structures, fixed and variable sized blocks, best-fit, first-fit, etc. garbage collection, fragmentation, buddy system, block compaction and relocation hash tables, programming exercises involving the implementation and use of data structures.

CIT 342: Formal Languages and Automata Theory

Introduction to language structures; languages and their representations; Grammars; formal notations, types, Chomsky's language hierarchy; sentence generation and recognition; derivations; Ambiguity and syntax and finite state automata; context-free grammars; simplification of context-free grammars; Chomsky, Greibach Normal Forms Push-Down automata, LR(K) grammars, Recursive languages; semantics. Lab. exercises.

CIT 344: Introduction to Computer Design

Introduction to numbers and codes. Combinational logic design and applications: adders, decoders, multiplexers, etc. Sequential logic design and applications: registers, flip-flops, etc., and general finite state machines. Memory devices: read-only memory (ROM), random access memory (RAM). Introduction to microprocessors: arithmetic logic unit (ALU), basic CPU architecture, addressing modes and program execution. Assembly language programming: programs for simple tasks; branching, loops, and subroutines.

CIT 351: C# Programming

Introduction to programming: Algorithms and flowcharts; Data types in C#; Operators and expressions in C#; Decision Structures in C#; control structures; Pointers and Arrays; Functions; File and Structs, Union and Bit-fields;

CIT 353: Introduction to Human Computer Interaction

Survey of human-computer interaction concepts, theories and practice. Basic components of human-computer interaction. Interdisciplinary underpinnings. Informed and critical evaluation of computer-based technology. User-oriented perspective rather than system-oriented, with two thrusts: human (cognitive, social) and technological (input/output, interaction styles devices). Design guidelines, evaluation methods participatory design, communication between users and system developers. Topics include: System

interaction design patterns, User Interface Design Criteria and User Interface Design and Programming tools, Multimedia and HCI

CIT 361: Data Communications

Introduction to waves, Waves analysis, Fourier Analysis (Fourier Series, Fourier transform) Z- transform, Analog and Digital transmission, Synchronous and Asynchronous transmission. Transmission media, Modulation, Data modems, Mathematical communication. Multiplexing (FDM, TDM, PCM), Data links protocols, Interfaces, Codes. Error detection and correction. Party loop check.

CIT 371: Introduction to Computer Graphics & Animations

Mathematics of 3-Ds and projections; graphical data structures; characteristics, and types of display memories; graphics hardware including digital plotters and display devices; graphics, software;

CIT 381: File Processing and Management

Review of basic, file processing concepts; the file management concepts; basic terminology and concepts; structure of file management systems; Data flow between systems; Data flow between systems; Data flow between internal memory and external storage; blocking and de-blocking; files; searching and sorting techniques, merging; relevant i/o facilities for files processing of some high level programming languages such as FORTRAN, COBOL, PASCAL, etc; file organization methods; sequential indexed, direct/random, etc; Data validation; report generation, file management packages; file management security and integrity; assignment and completion of a data processing project Structures.

CIT 383: Introduction to Object-Oriented Programming (2 units)

Object-Oriented Programming Concepts: Classes and objects, encapsulation, passing messages, abstraction, composition, inheritance, polymorphism, modularity. Using any object-oriented language discuss the following: Creating a Simple Class, Class Properties, Constructors and Destructors, Static Behaviour, Method Overloading, Constructor Overloading, Basic Operator Overloading, Overloading True and False using any object-oriented language, Logical Operator Overloading, Conversion Operator Overloading, Indexers, Inheritance.

CIT 389: Industrial Training

Required 3 months of Industrial Training Students experiences will be documented and presented in a Seminar and submitted as a Tutor Marked Assignment. An example of a report is a report of a case study of a Cyber Cafe.

CIT 392: Computer Laboratory II

Laboratory exercises using the programming language

Laboratory exercises using a microcomputer operating system, e.g. MS-97/98/2000

Laboratory exercises using relevant programming languages such as C and C^{++}. Submission of a group project report of case study of a computer centre. Laboratory Exercises in COBOL, ADA, and SQL.

MTH 307: Numerical Analysis II

Polynomial and Splines approximations: Orthogonal polynomials and Chebyshev approximations, Least squares, Cubes spline; Hermite approximations; Numerical integration. Boundary value problems. Introduction to numerical solutionof partial differential equations.

MTH 381: Mathematical Methods III

Functions of several variables: Jacobian, functional dependence and independence. Multiple integrals, line integrals. Improper integrals. Vector Field theory: Relations between vector field functions. Integral theorems. Gauss's, Stoke's and Green's theorems. Elementary tensor calculus. Functions of a complex variable: The Cauchy-Riemman equations. Integration of complex plane. Cauchy's theorem Cauchy's inequality. The residue theorem and the evaluation of integrals. Integral Transforms: Fourier and Laplace transforms. Convolution properties and their applications.

MTH 382: **Mathematical Methods IV**

Ordinary Differential Equations: The concept of existence and uniqueness of solutions. Operational methods of solution of linear equations. Sturm-Lionville theory, Green's functions, series solution. Special functions and some of their elementary properties; Gamma and Beta functions. Partial Differential Equations: Solutions of boundary and eigenvlaue problems of partial differential equations by various methods which include: Separation of variables, transform techniques. Sturn-Liouville theory; Green's functions; method of characteristics.

STT 311: Probability Distribution II

Probability spaces measures and distribution. Distribution of random variable spaces. Product probabilities. Independence and expectation of random variables. Convergence of random variables. Week convergence almost every where, laws of large numbers. Characteristic function and inversion formula.

CIT 403: Emerging Technologies (3 Units)

Students are expected to write a seminar paper on any new and recent technologies/topics in the market such as: Artificial Intelligence, ASPs (Application Service Providers), Distributed Java Database and Computing Issues, E-Commerce Internet Broadcasting, Internet Collaboration Internet Multimedia, Linux Platforms, Software Object-Oriented Databases and Software Development , Voice I/O (Computer Input/Output), Voice over IP (IP Telephony) XML

CIT 411: Microcomputers and Microprocessors

Review of basic concepts in digital electronic; Microprocessors; functions, operations and architecture; comparison of current microprocessors; multi-chip and single chip; i/o organization; assembler language; comparison of instruction sets; address modes, stack operation; subroutines. i/o data transfer; bus control; daisy chaining, handshaking etc; Interrupt structures; programmed transfer, DMA microcomputer systems; types of microprocessors; uses of microprocessors, microcomputer design for specific applications; microcomputer networking; interfacing microcomputer real-time control; laboratory exercises using an assembly language

CIT 412: Modelling and Simulation

Basic modelling and simulation concepts and definitions; Random numbers – pseudorandom number generation and testing; Monte Carlo methods;. Introduction to distribution functions; Simulation and modelling – discrete-event simulation, continuous simulation. Modelling methods; Visual models and Conceptual models, Physics-based models and finite element model, Data-based models; Statistics for Modelling and Simulation; Simple theories of Queues, stochastic processes Design of simulation experiments; simulation languages, detailed study of a chosen simulation language; applications; System Dynamics. Lab. exercises. Data collection and coding. Data cleaning-completeness, range, consistency. Case studies and examples using SPSS or PSAT packages. Interpretation of results.

CIT 421: Information Theory and Computer Communication Systems

Historical background of information theory models or computation systems, coding theory. Information and encoding, basic concepts of interactive computing, interactive terminals devices protocols, direct links, communication channels, telecommunications links, simplex, half duplex, duplex, multiplex, concentrators,

computer networks operating system for online processing routing algorithms, response, time reliability and security.

CIT 425: Operations Research

The nature of operation research; Linear programming, simplex method, Transportation problem, allocation problems; Quadratic and Goal programming; Queue theory, Game theory; Search Analysis; Inventory control; Network Analysis; Replacement Analysis and Simulation; maintenance and reliability problems. Dynamic programming; sequencing and co-ordination.

CIT 427: Database Systems & Management

Basic concept of data bases, history of DBMS types of database, specific problems of data independence, data reliability, integrity, etc, data, data management, database generation, raw data, data definitions, data structure, storage structure database logical and physical organization, interrogation, data model, network, hierarchical, relational, security, policies, privacy quality and integrity protection mechanism. Introduction & Basic SQL Project Introduction. Advanced SQL. Conceptual Modelling and Schema Design. Database Programming, JDBC, Regular Expressions. Functional Dependencies E2: Functional Dependency & Relational Algebra. Introduction to XML. XML and X-Query. Web Services. Transactions. Recovery. Database Heterogeneity.

CIT 432: Software Engineering II

Programme Testing; software Reliability models Availability models. Management Techniques. Formal Methods, e.g. VDM, OBJ

CIT 445: Principles and Techniques of Compliers

Recapitulation of formal grammars; source code and target code structure of typical compiler, comparative compiling techniques. Lexical analysis syntax analysis; simple precedence, operator precedence, LR(K) parsers; semantics, Runt time storage allocation code generation and code optimization. Compiler-compilers. Pragmatics of Compiler writing: Translator writing Error recovery and Optimization problems; Laboratory exercises leading to the productions of major parts of a compiler for an actual programming language.

CIT 461: Internet Architecture & Communications

History of the Internet. Internet protocols (IP, FTP, HTTP, TCP). Network topologies. Renters. Bridges. Gate ways. Backbones. World Wide Web (WWW). TTP Sites and examples. Internet Browsers (Internet explorer, Netscape). Role of ISP's Internet Connectivity Requirements. E-mail, E-Business. Website design and Hosting. Engines.

CIT 462: Web Server Technology

Review of XHTML (Extensible Hypertext Mark-Up Language) and CSS (Cascading Style Sheets). Introduction to client-side scripting languages such as JavaScript in Web application development. Use a client-side programming language such as JavaScript to develop interactive Web content including forms, style sheets, data validation, and animation. Introduction to Web server technology and Web-based applications. Survey of server-side programming languages such as CGI-Perl and PHP. Introduction to XML (Extensible Markup Language). An overview of database operations. Introduction to the deployment of applications to a Web server. Complete an integrated Web application that integrates a database along with client-side and server-side applications.

CIT 463: Introduction to Multimedia Technology

Introduction: What is multimedia, Multimedia systems, Quality of service, Synchronization & orchestration, Standards, Convergence, Value chain. Hardware: Multimedia computers, Video and graphics, Audio, Telephone, video conference, and networks, CD and DVD, USB and FireWire, Processors, Video for Windows, DirectX, and ActiveMovie. Software: Browser based software architecture, Distributed software, Servers, Network, Terminals. Audio and Video: Digital audio; Psycho acoustics, Digital presentation of sound, Digital images, JPEG, Video signal, Camera sensors, Colours, Colour television, Equipment, Compression systems, Basics of video compression, Methods, Algorithms. Interchange Formats: Application areas, Requirements, Track and object model, Real-time transfer, Different transfer formats, Comparison. Authoring Tools: Production process, Tools, Barriers, Development areas. Communications: QoS, ATM, QoS implementations, Integrated Services, Differentiated Services. Multicast: Group control, Routing, Real-time transfer and control protocols, Resource reservation, Session control, M-Bone. Video Conference: Standards, Products, Internet telephony, CTI (Computer Telephony Integration). Access Networks: Cable television, Digital subscriber lines, UMTS, Digital television.

CIT 465: Network Administration

Introduction to Network Administration: scope, goals, philosophy & standards. IT System Components and Network Structures, technology and protocols. System Administration: host computer and user management. Network Administration methods and Standards. Managing devices using SNMP and RMON. Management issues: planning, implementation, fault diagnosis

and recovery. Network Simulation as a management tool. Network Documentation. Network Security and Administration.

CIT 467: Visual Programming and Applications

Visual Programming concepts. Visual programming languages (Visual Basic, Visual Fox Pro, Visual C++,….) website design. Website Design Applications (Front page 2000, Claris, etc.) HTML, Java language

CIT 469: Protocols Design and Programming

Introduction. Stages in Protocols design: Problem definition, requirements analysis, protocol design and implementation in software. Protocol design tools. Overhead: bandwidth, CPU, etc. Protocol life cycle. Preparing for future versions of the protocol: version numbers, reserved bit fields, forwards and backwards compatibility. Parameters setting. Desirable protocol features: auto-configuration, robustness (simple, self-stabilization and Byzantine robustness. Documentation and standardization. Planning an upgrade path for future versions. Mobility. Ubiquitous computing. Comprehensive security: Nano-computing, bio-computing.

CIT 474: Introduction to Expert Systems

Study of different classes of expert systems, e.g. Rule Based: MYCIN or PROSPECTOR, Blackboard; HEARSAY or CRYSLIS, Expert System shells e.g. Rule-Based: e.g. P-MYCIN, EXPERT. S.I. Frame Based e.g. KEE, KL-ONE Merit and Demerits of natural language interface for expert systems. Extensive independent study of recent development in the field and the submission of a group proposal for the application of Expert System in different areas.

CIT 478: Artificial Intelligence

Basic AI issues attention, Search, Control, Game trees, knowledge representation, Application of AI techniques in natural language, scene analysis, expert systems, KBCS robot planning. Lab. exercises in AI lang. e.g., LISP/Prolog.

CIT 484: Website Design & Programming

What is HTML; Basic Tags of HTML; HTML Tag TITLE Tag Body Tag Formatting of Text, Headers, Formatting Tags, Pre-Tag FONT TAG Special Characters Working with Images META Tag; Links: Anchor Tag, Lists; unordered lists ordered lists, definition lists, tables : TABLE, TR and TD Tags Cell

spacing and cell padding colspan and Rowspan Frames: Frameset frame Tag, NOFRAMES Tag Forms: FORM and INPUT Tag,; Text Box Radio Button, checkbox. Select tag and pull down. Lists hidden submit and Reset. Some special Tags: COLGROUP, THREAD, TBODY, TFOOT, blank self, parent top, IFRAME LABEL TEXTAREA. INTRODUCTION TO Java Script: Java script variables and data types. Statement and operators, control structures object based programming message box in JavaScript, Javascript with HTML forms

CIT 499: Project

Individual or Group projects of approved topics related to the current research interests in the department.

4.10.4 Degree award requirements (examples):

In order to be considered for graduation, a student must:

- earn a total credit of 120 for regular entry students (100 Level entry) and 90 for direct entry students (200 level entry).
- pass ALL compulsory courses
- be in good standing (a minimum OF CGPA 1.5).
- complete his/her: research project, Student Industrial Work Experience and Seminar on Emerging Technologies

4.11 GRADE POINT AVERAGE (GPA) AND CUMULATIVE GRADE POINT AVERAGE (CGPA)

4.11.1 Formula for calculation of GPA and CGPA

The Grade Point Average (GPA) is computed by multiplying the Grade Point (GP) attained in each course by the course credit unit and then summed up and divided by the total units taken in a semester

Courses (a)	Credit Unit (b)	Raw Score (c)	Letter Grade Point (d)	Grade Point (e)	Weighted Grade Point (f)
CIT351	3	26	F	0	0
CIT411	2	71	A	5	10
CIT425	3	64	B	4	12
CIT309	3	70	A	5	15
CIT333	3	65	B	4	12
Total	14				49

Column (f) is obtained by multiplying column (b) by column (e).

The GPA is obtained by dividing the sum of column (f) by sum of column (b) which is 49/14 = 3.5

4.12 CLASS OF DEGREE

The classification of degrees at the National Open University of Nigeria is determined on the basis of a learner's cumulative grade point average (CGPA) at the end of his/her degree programe as follows:

S/N	Degree/Certificate	CGPA
1	First Class	4.50 – 5.00
2	Second Class (Upper)	3.50 – 4.49
3	Second Class (Lower)	2.40 – 3.49
4	Third Class	1.50 – 2.39
5	Fail	0.00 – 1.49

Table 1: Classification of Degree in NOUN

4.13 GOOD ACADEMIC STANDING

Good academic standing ensures student have at least a minimum of 1.5 CGPA.

4.14 END OF PROGRAMME CLEARANCE

Student process end of programme clearance through study centers. The center furnishes the candidate with details of the process.

PART 5: ASSESSEMENT AND EVALUATION

5.1 Introduction

NOUN uses two modes of assessment for its students. These are continuous assessment and end of semester examination. The nature of the assessment is as follows

- Self-assessment exercise within each unit of study
- Tutor marked assignments (TMAs) at the end of each unit of study
- End of semester examinations including project work or practical hands-on session

In courses such as Seminar and Practical based courses such as Student Work Industrial Experience (SIWES) students do not take the TMA and examination. In the Student Work Industrial Experience (SIWES), the grading is composed of three components: evaluation by site supervision conducted by NOUN staff or NOUN appointed assessor, evaluation of learner's technical report, and evaluation of Seminar delivered by the learner at the end of the training. In

the Seminar courses, the grading is composed of three components: evaluation of learner's term paper and evaluation of Seminar delivered by the learner.

5.2 Tutor Marked Assignments (TMA)

These assignments are provided by the tutors at any time preceeding the end of semester examination. Students are required to attempt and submit them via the TMA portal. There are usually four TMAs per course but the best three are used for computation. Each TMA is weighed 10%. The TMA forms 30% of the overall grade of the course.

5.2.1 Opening and Closing of TMA portal

The TMA portal is opened to students few weeks into the semester and closed a few weeks to the examination. Within this period, students are expected to attempt, complete and submit their TMA via the portal.

5.3 End-of-Semester Examinations

The end-of-semester examination constitute 70% of the finally grade earned in the course. The examination is usually pen-on-paper for 300 Level courses and above. 100 Level, 200 Level and GSTs are usually eExamination.

5.3.1 The eExamination

The eExamination is usually done on the computer at the various study centers. A timetable for the courses is released to students. Students are to go to their study on the day allocated for their courses and within the timeslot allocated for the paper. The duration of each paper is determined by the credit unit of the course. Student attempt and submit the eExamination on the computers systems provided. This constitute 70% of the finally grade earned in the course.

5.3.2 Pen-on-Paper (PoP) Examinations

Pen-on-paper are usually for 300 Level courses and above (except the GST courses). . A timetable for the courses is released to students. Students are to go to their study on the day allocated for their courses and within the timeslot allocated for the paper. The duration of each paper is determined by the credit unit of the course. Students answer the questions on their answer booklets which are retrieved at the end of the allocated time. This constitute 70% of the finally grade earned in the course.

5.3.3 Opening and Closing of Examination Portal

The examination is held at the various study centres. Dedicated systems are provided for the examination process from the first day allocated on the timetable to the last day on the timetable. The duration for each course/paper is determined by the credit unit of the course.

5.4 Examination Procedures

5.4.1 Policies

Students overall grading is based on two segments: Tutor Marked Assignment and end-of semester examination (except for practical based courses and seminar courses).

All end-of-semester examinations (pen-on-paper and eExamination) are administered only at the various study centres.

Student final overall grades are graded accordingly (see table below)

S/N	Letter Grade	Grade Point	Description	Percentage
1	A	5	Excellent	70% and above
2	B	4	Very Good	60% - 69%
3	C	3	Good	50% - 59%
4	D	2	Satisfactory	45% - 49%
5	E	1	?	40% - 45%
6	F	0	Failed	39% and below

Table 1: Scoring and Grading System in NOUN (Undergraduate)

S/N	Letter Grade	Grade Point	Description	Percentage
1	A	5	Excellent	70% and above
2	B	4	Very Good	60% - 69%
3	C	3	Good	50% - 59%
4	F	0	Failed	49% and below

Table 2: Scoring and Grading System in NOUN (Postgraduate)

DEPARTMENT OF ENVIRONMENTAL SCIENCE

B.Sc. ENVIRONMENTAL SCIENCE AND RESOURCE MANAGEMENT

Programme Code: 5205

PROGRAMME AND DEGREE AWARD REQUIREMENTS. To graduate, a student shall have undergone 8-10 semesters of study depending on entry point, including field practical training. Course work load must meet the graduation requirements of the University based on minimum academic standards. However, in doing so, the student must earn a minimum of 120 credit units for the four year programme in Environmental Science and Resource Management. Direct entry (200-Level) students must earn a minimum of 90 credit units. The submission of an undergraduate project thesis based on supervised research is a graduation requirement which must not be compromised

This Environmental Science and Resource Management Degree covers the basic principles of the biological, chemical and physical sciences, but also covers economic and other social sciences in order to gain an understanding of human interactions with the environment. This degree will equip the environmental managers of the future with the scientific background and the ability to apply it to real-life environmental problems. The Environmental Management degree programme applies scientific principles and management objectives to a range of environmental problems such as pollution, climate change and mechanisms for their mitigation, including legislation.

1. Brief History The Bachelor of science (**BSc. (Hons)** in Environmental Science and Resource Management is one of the university's pioneer programmes that started in 2003. Currently, the registered student population for this course in all the study centres is over 3,000. Facilitators for this course are over 50 in number with qualifications not less than a PhD. Degree. This four-year programme is being phased out and being replaced by B.Sc. Environmental Management and Toxicology, a five-year programme. Admission into B.Sc. Environmental Science and Resource Management programme ceased since June, 2017.

2. About the course

This Environmental Science and Resource Management Degree covers the basic principles of the biological, chemical and physical sciences, but also covers economic and other social sciences in order to gain an understanding of human interactions with the environment. This degree will equip the environmental managers of the future with the scientific background and the ability to apply it to real-life environmental problems. The Environmental Management degree programme applies scientific principles and management objectives to a range of environmental problems such as pollution, climate change and mechanisms for their mitigation, including legislation.

3. Mission of the University

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

4. Description of the Programme---B.Sc. Environmental Science & Resource Management

5. 0 Admission Requirements

- The minimum entry requirements for BSc. Environmental Science and Resource Management are five (5) O' Level (SSCE/NECO/G.C.E/NABTEB) Credits at not more than two sittings including: English and Mathematics and any of Geography, Physics, Chemistry, Biology, Agricultural Science and Economics.

Direct Entry:

- Two (2) A level credit passes in Science or Social Sciences subjects with five (5) O level subjects in English Language and Mathematics and any of Geography, Physics, Chemistry, Biology, Agricultural Science and Economics.

- OND/HND Certificate holders in relevant fields in addition to O level requirements.

5.1 Graduation Requirements

To graduate, a student shall have undergone 8-10 semesters of study depending on entry point, including field practical training. Course work load must meet the graduation requirements of the University based on minimum academic standards. However, in doing so, the student must earn a minimum of **120** credit units for the four year programme in Environmental Science and Resource Management. Direct entry (200-Level) students must earn a minimum of **90** credit units. The submission of an undergraduate project thesis based on supervised research is a graduation requirement which must not be compromised.

6. Philosophy of the Programme

The philosophy of the B.Sc Environmental Science and Resource Management programme, anchored on the ODL principles of accessibility and flexibility, is to produce graduates who are environmentally literate, sensitive and skilful. It also seeks to produce graduates who can make objective contribution to national development by providing solution(s) to natural and man-made

environmental problem arising from environmental abuse and make surface of the earth to be functionally habitable and sustainable. The programme is mounted through virtual classroom instruction, learner-support laboratory practical, ancillary field demonstrations and e-learning resources.

7. Aim

The aim of the B.Sc. Environmental Science and Resource Management Programme is to give students a broad knowledge and understanding of contemporary environmental challenges, theories, concepts, skills and the strategies for managing them.

8. Objectives:

The programme has four broad objectives all within the context of its philosophy:

- To teach the understanding of both the biophysical and human environments, and the relationship between the two.
- To impart the skills, methodologies and analytical techniques required to conduct in-depth research in human and biophysical environment and their interactions
- To impart the ideas and concepts of rational management with respect to the planning, conservation, restoration and sustainable use of the environment.
- To acquire basic understanding of environmental problems and how to proffer solution to them.

9. Rationale/Justification

The course is in line with the mission of the National Open University of Nigeria. The "environment" has become a global issue, as such,

- Students are provided with up-to-date information on environmental trends through the programme.
- Students are equipped with sufficient skills in the theory and practical applications.

a. In terms of cost-effectiveness and flexibility, the cost of running the programme is affordable for the students.

b. Students will be able to learn in any place and at any time convenient for them irrespective of their roles.

c. Relevance to national needs (evidence of relevance from National Manpower Board

to be attached).

d. On completion of the course, the students would have been well prepared for the growing national need for manpower in the following areas:

- Education: reference to primary, secondary and tertiary institutions

- Civil Service: Public and private
- Research institute
- Self employment

10. Staffing.

ACADEMIC STAFF

S/N	NAMES	STATUS	QUALIFCATION
1.	Professor Joseph Omada	Professor	B.Sc., M.Sc., PhD Geology
2.	Dr. Emily O. Iduseri	Lecturer II	B.Sc., M.Sc., PhD Geography / Urban and Regional Planning
3.	Mr. Henry Agbebaku	Lecturer I1	B.Sc., M.Sc. Geography
4.	Mr. Kadafur Samson	Assistant Lecturer	B.Sc. Botany, M.Sc. Environmental Management

11. The Curriculum

Programme Outline

Outline of Course Structure

100 Level 1st Semester

Course Code	Title	Unit(s)	Status
GST 101	Use of English & Communication Skills I	2	C
GST 107	The Good Study Guide	2	C
BIO 101	General Biology 1	2	C
BIO 191	General Biology Practical I	2	C
CHM 101	Introductory Inorganic Chemistry I	2	C
CHM 103	Introductory Physical Chemistry I	2	C
CIT 101	Computers in Society	2	C
MTH 101	General Mathematics I	3	C

PHY 101	Elementary Mechanic, Heat, and Properties of matter	3	C
PHY 191	Introductory Physics Laboratory I	1	C
	Total Credit Units – Compulsory	21	
	Total Credit Units – Elective	0	
	Total Credit Units	**21**	
100 Level 2nd Semester			
Course Code	**Title**	**Unit(s)**	**Status**
GST 102	Use of English and Communication II	2	C
BIO 102	General Biology II	2	C
BIO 192	General Biology Practical II	2	C
CHM 102	Introductory Organic Chemistry	2	C
ESM 102	The Nigerian Environment	2	C
ESM 104	Introduction to Environmental Science	1	C
ESM106	Environmental Resource Management	2	C
ESM 112	Introductory Ecology	1	C
MTH 102	General Mathematics II	2	C
PHY 102	Electricity, Magnetism and Modern Physics	3	C
PHY 192	Introductory Physics Laboratory II	1	C
	Total Credit Units – Compulsory	20	
	Total Credit Units – Elective	0	
	Total Credit Units	**20**	

200 Level 1st Semester

Course Code	Title	Unit(s)	Status
GST 201	Nigerian Peoples and Cultures	2	C
GST 203	Introduction to Philosophy and Logic	2	C
CHM 201	Physical Chemistry II	2	C
CHM 203	Organic Chemistry II	2	C
CHM 205	Inorganic Chemistry II	2	C
ESM 211	Global Environmental Issues	2	C
ESM 273	Environmental Sociology	2	C
ESM 221	Ecotourism	2	C
ESM 231	Introductory Toxicology	2	C
ESM 291	Map Analysis	2	C
	Total Credit Units – Compulsory	20	
	Total Credit Units – Elective	0	
	Total Credit Units	**20**	
200 Level 2nd Semester			
Course Code	**Title**	**Unit(s)**	**Status**
GST 202	Fundamentals of Peace Studies &Conflict Management	2	C
BIO 206	Biostatistics	2	C
ESM 204	Environmental Hazards and Disaster Management	2	C
ESM 222	Water Resource Evaluation	2	C
ESM 236	Environmental Microbiology	2	C
ESM 238	Air Photo Interpretation	3	C
ESM 262	Environmental Planning and management	2	C

ESM 292	Environmental Economics	2	C
ESM 299	SIWES I	3	C
	Total Credit Units - Compulsory	20	
	Total Credit Units – Elective	4	
	Total Credit Units	**24**	

Electives

ESM 206	Community Participation in Environmental Management	2	E
ESM 212	Tropical Climatology	2	E
ESM 234	Soil Resources	2	E

300 Level 1st Semester			
Course Code	**Title**	**Unit(s)**	**Status**
GST 301	Entrepreneurial Studies	2	C
ESM 301	Introduction to Peace and Conflict Resolution	2	C
ESM 305	Field Trip in Environmental Science	3	C
ESM 311	Noise and Air Pollution	2	C
ESM 317	Land and Water Pollution	2	C
ESM 341	Introduction to Instrumentation Measurement and Field Methods in Environmental Science	2	C
ESM 345	Applied Climatology	2	C
	Total Credit Units - Compulsory **Total Credit Units – Elective**	**15** **4**	

	Total Credit Units	**19**	

Electives

CIT 353	Introduction to Human Computer Interaction	2	E
AEM 303	Agrarian Institution and their Management	2	E
ESM 303	Environmental Laws and Policies	2	E
ESM 343	Climate Change and Environment	2	E

300 Level 2nd Semester

Code	**Title**	**Units**	**Status**
CHM 314	Environmental Chemistry	2	C
ESM 304	Research Methods	3	C
ESM 322	Water And Waste Water Management	2	C
ESM 328	Biodiversity Conservation	2	C
ESM 342	Environmental Impact Assessment and Auditing	3	C
ESM 392	Remote Sensing	2	C
ESM 399	SIWES II	3	C
	Total Credit Units – Compulsory	**17**	
	Total Credit Units – Elective	**6**	
	Total Credit Units	**23**	

Electives

ESM 306	Environmental Politics	2	E
ESM 308	Rural Development Strategies	2	E
ESM 324	Urban Environmental Management	2	E
ESM 326	Oceanography	2	E

400 Level 1st Semester			
Course Code	**Title**	**Unit(s)**	**Status**
ESM 401	Research Project	4	C
ESM 405	Environmental Protection Agencies: Case Studies	2	C
ESM 407	Geographic Information System	3	C
ESM 423	Hydrology and Water Resources	3	C
ESM 431	Environmental Health and Safety	3	C
	Total Credit Units – Compulsory	**16**	
	Total Credit Units – Elective	**4**	
	Total Credit Units	**20**	
Electives			
ESM 411	Population, Environment and Development	2	E
ESM 403	Environmental Perception	2	E
ESM 421	Elements of Land Surveying	2	E
ESM 435	Environmental Engineering Services	2	E

400 Level 2nd Semester			
ESM 426	Biogeography	2	C
ESM 428	Ecology of Natural Resources	2	C
ESM 444	Industrial Wastes and Industrial Water Treatment	2	C
	Total Credit Units – Compulsory	**6**	
	Total Credit Units – Elective	**4**	
	Total Credit Units	**10**	

Electives

ESM 424	Fresh Water Ecology	2	E
ESM 422	Resource Evaluation	2	E
BIO 408	Soil Ecology	2	E

COURSE DESCRIPTION

100 LEVELS

GST 101: Use of English and Communication Skills I

Listening enabling skills, listening and comprehending comprehension, note taking and information retrieval. Including data, figures, diagrams and charts. Listening for main idea, interpretation and critical evaluation. Effective reading. Skimming and scanning. Reading and

comprehension at various speed levels. Vocabulary development in various academic contexts. Reading diverse texts in narratives and expository. Reading and comprehension passages with tables, scientific texts. Reading for interpretation and critical evaluation.

GST 107: The Good Study Guide (2 units)

Getting started, reading and note taking; other ways of studying, working with numbers. What is good writing? How to write essays. Preparing for examinations.

BIO 101: General Biology 1 (2 units)

Characteristics of living things; cell as the basic unit of living things; cell structure, organisation, cellular organelles, tissues, organs and systems. Classification of living things, general reproduction and concept of interrelationships of organisms. Heredity and evolution; Elements of ecology (introduction) and habitats.

BIO 191: General Biology Practical 1 (2 units)

What practical biology in biology involves. Laboratory organisation. Handling Common Laboratory equipment; Microscopic handling and maintenance; Making microscopic measurement; Procuring animal materials for practical; Killing, preserving and maintaining animal materials; Procuring plant materials; External features of plants (differences and similarities); Preparation of temporary slides; Preparation of strains and reagents; Techniques for microbial culture and grain staining; Setting up demonstration for physiological processes in plants; Setting up apparatus for demonstrating physiological processes in animals. Preparation required for dissection.

CHM 101: Introductory Inorganic Chemistry I (2 Units)

Hypothesis, theory and law with appropriate illustrations. Nature of matter – 3 states of matter, atomic structures, electronic energy levels and orbitals. Periodic classification of elements and its relationship to their electronic configuration. Chemical bonding, survey of properties and trends in groups I II, IV, V & VII metals

CHM 103: Introductory Physical Chemistry (2 units)

Mole concepts and calculations based on it. Methods of expressing concentration. Chemical kinetics and equilibria and related calculations. Important application of equilibria. PH, solubility products and solubility of ionic solids. Thermo Chemistry and simple calculations based n Hess's law. Electro Chemistry and working of various cells.

Brief mention of corrosion, Chemical thermodynamics, oG = oH – ToS.

CHM 191: Introductory Practical Chemistry I (2 units)

Practical based on CHM 101 and CHM 103: Cations and Anions-Identification, Acid-base titrations, redox reactions and determinations

CIT 101: Computers in Society (2Units)

What is a computer?; types of computer; history of digital computer; elements of a computer: Hardware and software; How to work with a computer; Operating system; Windows Files: word processing, copying a text, saving, changes to a document, formatting, spelling checker and introduction to printing a document; Spreadsheet: entering and correcting data, using formula, numeric formats, creating charts, types of chart, power points and presentations. Networking: internet and email, reading and responding to an electronic mail message.

MTH 101: Linear Algebra I (2 Units)

Definition of a matrix and types of matrices; Equality of matrices; transpose of a matrix; Hermittan matrix; Skew Hermittan; matrix Algebra: Properties of matrix addition; Scalar multiplication; matrix multiplication. Linear equations; linear equation in two unknowns; General systems of linear equations. Determinants: Determinants of 2 x 2 matrix; Determinants of 3 x 3 matrix: properties of determinants; Inverse of matrices; Inverse of a square matrix; Inverse of a non-singular 2 x 2 matrix; Inverse of a 3 x 3 square matrices; Invertible matrices and Determinants; Row Echelon form and system of equations; solving systems of equation by row, Reduced Echelon form; Determinant and systems of equations; Transformation of the plane; some properties of transformation: Vector spaces; Definitions; subspacks, ranks of a matrix; linear dependence; Basis of vector; Wronskian of functions.

PHY 101: Heat and Properties of Matter 2 Unit(s)

Heat and temperature, work and heat, Quantity of heat: heat capacities, latent heat; Thermal expansion of solids, liquids and gases; Gas laws, heat transfer; Laws of thermodynamics, isothermal and adiabatic changes, Carnot cycle; Application to kinetic theory of gases; Simple kinetic theory of gases, the van der Waals gas. Classification of matter into (solids, liquids and gases, forces between atoms and molecules, molecular theory of matter, Elasticity, plasticity, Hook's Law, Young's Shear and bulk Moduli) Crystalline and non-crystalline materials, Hydrostatics: pressure, buoyancy, Archimedes' principle; Hydro-dynamics-streamlines, Bernouli and continuity equations, turbulence, Reynold's number, Viscosity, laminar flow, Poiseuille's equation; Surface tension, adhesion, cohesion, capillary, drops and bubble

GST 102: Use of English and Communication Skills II (2 Units)

Writing paragraphs; Topic, sentence and coherence;Development of paragraphs; illustration; Description; cause and effect including definitions;Formal letters: essential parts and stylistic forms; complaints and requests;jobs;ordering goods; letters to government and other organisations; writing reports; reporting events, experiments, writing summaries.

CHM 102: Introductory Organic Chemistry (2 Units)

Simple reactions of hydrocarbons, alcohols and acids, petroleum Chemistry, oils and fats. Hydrogenation of oils. Polymer and biological important molecules.

ESM 102: The Nigerian Environment(1 unit)

General description of the natural, physical features of Nigeria: Vegetation, climate and climatic changes within the geographical expression; Geographical distribution of people and natural recourses. Brief description of economic importance of these features. Exploration and exploitation of natural resources. Brief impact of these on the environment

ESM 104: Introduction to Environmental Science (1 unit)

Scope and meaning of environmental science; the concept of the earth's surface as the home of man; atmosphere and atmospheric processes; hydrosphere and the hydrological cycle; the lithosphere and the process of sculpturing the earth's surface; the lithosphere and the biological

productivity of the earth's surface; the earth surface in natural history; the current environmental concern and environmental hazards.

ESM 106: Environmental Resource Management (1 unit)

Fundamentals of Environmental Resources Management, Historical Perspectives of Environmental Resource Management, Instruments in Environmental Management, Fundamental of Wildlife Management, Problems of Forest Resource Management, Strategies for forest resource management; Renewable Resources Management and Non- Renewable Resources Management, The Nigerian Conservation Foundation and other agencies concerned with environmental resource management.

ESM 112: Introductory Ecology (1 unit)

General consideration of ecosystems including influence and interaction of human beings with their environments. Similarities, differences of ecosystems. Characteristics and ecological adaptations of various forms life.

MTH 102: Introductory Statistics (2 Units)

Measures of central tendency and dispersion (grouped and ungrouped); mean: arithmetic and geometric, harmonic, median, mode, quartiles, deciles, modes, relative and absolute dispersion, sample space and events as sets. Finite probability space properties of probability. Statistical independence and conditional probability. Tree diagram. Bayes theorem, Discrete and discontinuous random variables. Expectation, independent Bernoulli trials. Binomial Poisson and Normal Distributions. Normal approximations to binomial and Poisson Distribution, Hyper geometric.

MTH 112: Differential Calculus (2 Units)

Real Number: The number line, intervals, properties of absolute value, solving inequalities sign chart. Function from IR to IR, domain range, graph, monotonically increasing, decreasing functions. Inverse functions. Composition of functions. Even and odd functions, periodic functions, Limits, Convergence sequences. Limits of a function, left and right limits and continuity. Differentiability at a point and on an interval. Sum, product and quotient rule. Chain rule for inverse function. Implicit differential.

MTH 122: Integral Calculus (2 Units)

Fundamental theorem of calculus. Integration by parts, change of variable method, integration of rational functions, trigonometric integral, trigonometric substitutions. Numerical integration: Trapezium method**.**

PHY 102: Electricity, Magnetism and Modern Physics (2 Units)

Electrostatics: Coulomb's law, Gauss's law, potential and capacitance, dielectrics, production and measurement of static electricity. Current: Ohm's law, resistance and resistivity, heating. Galvanometers, Voltmeters and Ammeters; D.C. circuits: sources of emf and currents, Kirchhoff's laws; Electrochemistry; The Earth's magnetic field; Magnetic fields and induction, Faraday's and Lenz's laws; Force on a current-carrying conductor. Biot-Savart law. Flemming's right and left-hand rules, motors and generators. A.C. Theory. Atomic structure; Production and properties of X-rays; Radioactivity; Photoelectric emission.

200 LEVEL

GST 201: Nigerian Peoples and Cultures

History of traditional Nigerian peoples and culture : the pre-colonial history and the culture areas of Nigeria; the evolution of the country as a political unit. How to analyze and understand people's cultures from a historical, sociological and anthropological angle.

GST 202:Fundamentals Of Peace Studies & Conflict Resolutions(2 Units)

Basic Understanding of Conflict; Definitions, Causes and Types of Conflict, Conflict Theories, Phases in Conflict, Conflict Analysis & Transformation. Dynamics of Conflict; Relationship between Perception and Conflict, Language Barriers in Conflict and Resolution, Early Warning and Early Response Mechanism, Arms Control and Demilitarization, Peace and Education. Trends in Global Issues: International, Continental and Regional Organizations in the Pursuance of World Peace, Peaceful Methods of Conflict Resolution, Coercive Means of Conflict Resolution, Gender Issues and Humanitarian Intervention.

GST 203: Introduction to Philosophy and Logic (2 Credits)

General introduction to logic; clarity of thought, expression and arguments as basis for conclusions; fundamentals of logic and critial thinking; types of discourse; nature of arguments; validity and soundness; techniques for evaluating arguments; distinction between inductive and deductive inferences; etc. Illustrations from familiar texts, including literature materials, novels, law reports and newspaper publications.

BIO 206: STATISTICS FOR AGRICULTURE AND BIOLOGY (2 UNITS) Use of statistical methods in Biology and Agriculture. Continuous and discrete variables, Sampling procedure. Sample size. Presentation of statistical results. Frequency distribution. Law of probability, the binomial, Poisson and normal frequency distributions. Estimations and Tests of Hypothesis. Design of simple Agricultural and Biological experiments. Analysis of variance and co-variance, simple regression and corelation, contingency tables, some non-parametric tests. The use of statistical packages such as SPSS and Minitab in statistical analysis.

CHM 201: Physical Chemistry II (2 units)

Kinetic theory of gasses, behaviour of real gases; the laws of thermodynamic entropy and free energy, reactions and phrase equilibrium; reaction rate laws for gases where the concentration of the reactions are the same. Mechanism and theories of animalcular reactions.

CHM 203: Organic Chemistry II (2 units)

Factors affecting structure and physical properties of organic compounds; factors affecting availability of electrons, stereo-chemistry; energy of activation and free radical substitution reactions in alkenes. Functional group chemistry. Electrophillic and nucleophillicsubstitution reactions. Aromaticity. Various type of organic reactions; e.g. addition, free radical, elimination and substitution reactions.

CHM 205: Inorganic Chemistry II (2 units)

Chemistry of first row transition metals. Introduction to co-ordination Chemistry including elementary treatment of crystal field theory. Comparative Chemistry of the following elements:(a) Ga, In, TI, (b) Ge, Sn, Pb, (c) As, Sb, Bi (d) Se, Te, Po.

Elementary introduction to Organometalic Chemistry. Role of metals in biochemical systems.

ESM211: Global Environmental Issues (2 units)

System theory; the ecosystem concepts; the Gaia hypothesis; environment and society; sustainable development concepts; marine pollution; population and environment; world energy picture; biotechnology and genetic engineering (clowning); environmental green movements; transportation; tourism; sustainable urban development.

ESM 221: Ecotourism (2 units)

The concept of ecotourism; ecotourism as sustainable (responsible) tourism; resources for ecotourism in Nigeria; ecotourism and the impact on the environment; planning and development of ecotourism destinations; geographical information systems as planning tool; communities and eco-destinations; ecotourism projects in Nigeria.

ESM 231: Introductory Toxicology (2 units)

General description of toxicology, toxicity, toxins and hazardous Chemical assay, dose – response curve, Chemical statistics and their applications. Sources, types and effects of toxins. Cancer and cancer trends in Nigeria.

ESM 291: Map Analysis (2 units)

Maps and their limitations. Projections and their properties. Qualities of Projections for Nigerian maps. Base maps, Cartographic instruments, analysis of physical and human features in topographical maps. Analysis of areas and linear properties of drainage basins. Slope analysis; analysis of geological maps, settlement analysis, and transport pattern.

ESM 204: Environmental Hazards and Disaster Management (3 units)

Hazard and risk management, Risk assessment of environmental hazards. Types of hazards, occurrence, impacts, prevention. Disaster management strategies for both short term and long term.

ESM 206: Community Participation in Environmental Management (2 units)

Concepts of participation; rationale for public and private participation; objectives of public and private participation; identification of various community's modes and techniques of participation; constraints to participation in environmental management; role of non-governmental organizations (NGOs) in environmental management.

ESM 212: Tropical Climatology (2 units)

Meaning and scope of climatology and tropical climatology; the nature of the atmosphere; elements of weather and climate, radiation, temperature, precipitation; tropical climate; weather and climatic hazards in the tropics; physiological comfort; climate and urban planning in the tropics; tropical disturbances; tropical agro-climatology.

ESM 222: Water Resource Evaluation (2 units)

Water resources; sources and distribution; approaches to water resources evaluation; qualitative and quantitative approaches; water balance approach; need for evaluation; methods of measuring rainfall; analysis and interpretation of rainfall data; evapotranspiration measurements; stream flow measurements – stage, discharge-velocity, hydrographs analysis, flow variability and recession; hydrology of reservoirs. Water quality measurement and analysis – solute, suspended, bed load and yield.

ESM 234: Soil Resources (2 units)

Scope and nature of soil resources; physical and chemical properties of soils; soil formation, soil profile, soil classification; progress in soil mapping in Nigeria; soil determination; methods of soil survey; laboratory determination of soil properties – particle size distribution; bulk density, total porosity, PH, organic matter content, available phosphorous.

ESM 236: Environmental Microbiology (2 units)

General characteristics of microorganisms in the environment Sterilization and disinfection. Structure, ecology and reproduction of selected common microorganisms. Isolation of bacteria, fungi and viruses. Antigens and antibodies. Economic importance of some microbial groups.

ESM 238: Air Photo Interpretation (2 Units)

History of air photo photography, flight height, instruments for air photo interpretation, image analysis and interpretation. Issues and problems in air photography in the tropics.

ESM 273 ENVIRONMENTAL SOCIOLOGY (3 UNITS)

Impact of culture on the environment. The sacred forests (sacred groves) their original and functions including conservation values, protective role of culture (e.g. tradition including taboos) on plant and animal diversity and conservation. Effects of pollution, policy and education on the environment (e.g. Land use decree and Structural Adjustment Programme). Socioeconomic and cultural roles of conservation programme.

ESM 292: Environmental Economics (2 units)

Key concepts in microeconomics, applications to management of renewable and non-renewable natural resources. Cost and benefit weighed for major environmental problems including global warming, toxic wastes, water and air pollution and conservation of wilderness and biodiversity; issues of social externalities.

ESM 299: Industrial Training (SIWES I) (3 Units)

The end of the second semester will be devoted to practical training in areas contributing to pollution such as Construction firms, Conservation Centres, Extractive Industries, Waste Management Authorities, Manufacturing Industries and Tourism/ Resort Centres. This is expected to enable students acquire practical skills that have been learnt theoretically.

300 LEVEL

CHM 314: Environmental Chemistry (2 Units)

Concepts of elementary cycles. Characteristics of the atmosphere. Sources, types and effects of environmental pollution. Waste water treatment. Composition of domestic wastes. Water Chemistry and analysis. Chemical and physical instrumentation in environmental sciences.

CIT 353: Introduction to Human Computer Interaction(2 Units)

Survey of human-computer interaction concepts, theories and practice. Basic components of human-computer interaction. Interdisciplinary underpinnings. Informed and critical evaluation of computer-based technology. User-oriented perspective rather than system-oriented, with two thrusts: human (cognitive, social) and technological (input/output, interaction styles devices). Design guidelines, evaluation methods participatory design, communication between users and system developers. Topics include: System interaction design patterns, User Interface Design Criteria and User Interface Design and Programming tools, Multimedia and HCI

ESM 301: Introduction to Peace and Conflict Resolution (2 units)

Contending theories and approaches to the causes and characteristics of peace and conflict resolution. The acquisition, development and marketing of energy and other natural resources, conflict and co-operation between exploration/exploitation industries and host communities. Environmental impact of the activities of multinational corporations and industries. The logic of various forms of conflict interests including theories derived from problems mediation; emphasis on Nigerian situation and case studies.

ESM 303: Environmental Laws and Policies (2 units)

Analysis of legal, political, social and environmental dimensions of environmental problems; environmental control legislations; constitutional rights to environmental quality; the development and problems of citizen – initiated environmental litigations; federal and state response to environmental quality and standards; legal status of the former Federal Environmental Protection Agency and the powers of the Ministry of Environment; case studies of oil pollution; noise pollution components of planning laws in Nigeria; environmental laws, conventions and protocols.

ESM 305: **Field Trip in Environmental Science (3 units**)

Fundamentals of field principles and measurements including dumpsites, land fill/land reclamation, marine pollution, flood or drought, erosion site, waste management/recycling, forestry/forest conservation schemes. Field studies of manufacturing/Industrial sectors, Climatic/Meteorological Stations, rural/ urban environment as well as environmental impact assessment of projects.

ESM 311: Noise and Air Pollution (2 units)

Composition of air, Requirements for air quality, source of pollutants and noise. Threshold levels of pollutants, physical and Chemical changes in air resulting from domestics and industrial wastes. Mitigation and remediation methods.

ESM 317: Land and Water Pollution (2 units)

General description of land and water resources – with emphasis on economic aspects. Sources of pollutants. Impact of specific pollutants on ecosystems. Mitigation and remediation methods.

ESM 346 ENVIRONMENTAL PLANNING & MGT. (2 UNITS)

Principles of management as applied to the environmental profession. Personnel management in environmental management, methods of financing of plans, implementing and managing land use plans (Political, technical, administrative requirements). The civil services and central administration. Private sector participation in environmental management and project implementation, management of Technical staff and office at Local, State and federal levels. Theories of Power (Elitism, pluralism and maxims).

ESM 341: Introduction to Instrumentation, Measurements and Field Methods In Environmental Science (2 units)

Description of instruments for measuring air quality i.e. NO, O_2, CO, Relative air humidity e.t.c Noise level etc. Water, soil measuring instruments, corrosivity, resistance, PH, Conductivity, BOD e.t.c. Instrumentation and parameters for measuring wastewater prior to discharge; potable water for safe drinking. Ecological Sampling techniques, measurement of properties and quality of water, soil and air.

ESM 343: Climate Change and the Environment (2 units)

Description of the physical and chemical properties and processes that shape earth's surface, land, atmosphere, ocean and climate. Physical control on biological productivity will be evaluated. Specific topics will include global warming, air, pollution and transport. Stratospheric ozone, ocean upwelling of nutrients and productivity.

ESM 345: Applied Climatology (2 units)

Application of Climate to Industry, Agriculture, Aviation, building and human settlements; weather modification and their implication; Acid rain, econoclimate, Drought, flood, climate change and human affairs.

ESM 347: Environmental Aspects of Farming Systems (2units)

Farm systems and farming systems.The relevance of the farm-system approach

Classification of farming systems. Difficulties of farming systems. Problems and peculiarities of shifting cultivation. Characteristics and problems of permanent upland cultivation. Irrigation farming. Environmental and health implication of irrigation. Perennial crop farmingRanching. Institutional and environmental requirements of site related systems

ESM 304: Research Methods and Field Trip (3 units)

Elements of research, research design, Hypothesis formulation and testing, sampling techniques and Data sources, research proposal, thesis writing. Field trips to urban or rural environment for field research and teaching.

ESM 306: Environmental Politics (2 Units)

Description on how decisions on managing diverse natural resources, environmental quality and human health are made. Covers themes on liberty, justice, equality, power, democracy, property and risk important to understanding environmental politics. Studies environmental quality (shell/Ogoni). Examination of diverse strategies of management, trading, pollution. Topics will include definition of conservation and development dichotomy and its resolution.

ESM 308: Rural Development Strategies (2 Units)

Policy and policy thrusts for rural development in Nigeria 1900 to present day. Development needs of rural societies. Community development and roles of NGOs. Rural/urban migration. Urbanization of rural societies.

ESM 322:Water and Waste Water Management (2 units)

General description of water and its management. Potable water parameters, waste water treatment and parameters prior to discharge into the environment. Water treatment for consumption, general description of water treatment plants from source to table – design fundamentals. Element of wastewater microbiology. A follow through on a typical water or waste water engineering project.

ESM 324: Urban Environmental Management (2 units)
Urban growth and the rural-urban synergies; overcrowding and social disruption; the city as a source of environmental degradation; housing development; new management policies and strategies for urban liveability; human space, population and world resources.

ESM 328: Biodiversity Conservation (2 Units)

Loss of biological diversity and environmental pollution. Basic ecological and evolutionary principles underpinning efforts to conserve the earth's biodiversity. These principles will be examined in the context of efforts to halt the rapid increase in disappearance of both plants and animals. Some sociological and economic issues will be treated with emphasis on biological aspects of the crucial problems and case studies.

ESM342: Environmental Impact Assessment and Auditing (3 Units)
Origin and Evolution of Environmental Impact Assessment (EIA), Theory and practice of Environmental Impact Assessment, EIA legislation EIA process, Environmental Audit Process, Environmental Audit Report; (EAR) as management tools. Environmental Policy and compliance. Environmental Governance, Institutional framework for environmental management. Preparation of EIA report, methods of executing EIA. Selected case studies of EIA around the world.

ESM 392: Remote Sensing (2 units)
Principles of remote sensing, Image analysis and interpretation Nigeria SAT 1. Remote sensing applications in environmental studies

ESM 399: Industrial Training (SIWES II) (3 Units)

The end of the second semester will be devoted to practical training in areas contributing to pollution such as Construction firms, Conservation Centres, Extractive Industries, Waste Management Authorities, Manufacturing Industries and Tourism/ Resort Centres. This is expected to enable students acquire practical skills that have been learnt theoretically.

400 LEVEL

ESM 499: Research Project (4Units)
Presentation of seminar. Topics on environmental studies (oral and written presentations) for discussion by students. Carry out original work on environment studies and resource management.

ESM 403: Environmental Perception (2 Units)

The principles of man – environment relations. The objective environment. The environment as perceived. The concept of perception and formation of environmental images. Environmental perception and decision making.

ESM 407: Geographic Information System (3 Units)
Principles of GIS; GIS applications in Environmental Management, ARC Info, ARC view and other GIS packages.

ESM 423: Hydrology and Water Resources (3 units)

Definition and scope of hydrology; trends in hydrology; the hydrological cycle and the approaches to its study; the drainage basin as a hydrologic unit; precipitation, interception, infiltration and soil moisture evaporation and evapo-transpiration; runoff and floods; the hydraulic and mechanic of flood; runoff generation, contributing areas. Morphometry and runoff frequency: erosion by water on hill slope, sediment transport processes.

ESM 424: Fresh Water Ecology (2 units)
Detailed knowledge of the interactions between physical, chemical and biological processes in aquatic ecosystems; influence of human activities; characteristics of aquatic ecosystems; the structure of aquatic plants and animals communities – biofilms, macrophytes, fishes, nutrient cycling, aquatic productivity, wetland and catchment management and ecosystem health. Macro-invertebrates as biomonitors; blue – green algae, salinity, eutrophication; fresh water aquaculture systems and effluent control.

ESM 426: Biogeography (2 units)
Meaning scope and purpose of biogeography Ecosystem concepts, principles of ecology. Habitat preferences, ecophysiology, population dynamics and life history strategies of Nigerian Terrestrial vertebrates. The role of fire in Nigerian Environment, sampling and measuring wildlife habitat variables. Estimating animal abundance. Principles of wildlife management. Factors of plants distribution, vegetation analysis.

ESM 428: Ecology of Natural Resources (2 units)
Nature of resources; man and the natural environment, sustainability in the use of resources. Policies, laws and regulations on natural resources. Instruments of environmental protection. Conflicts in resource conservation. Economic, cultural, political and social considerations in

resource conservation and management. Watershed management and nature reserves. Wildlife conservation in Africa. Emerging issues in resources conservations.

ESM 444: Industrial Wastes and Industrial Water Treatment (2units)
Open and close recirculation water systems and their treatment. Boilers and boiler water treatment. Scaling tendencies, biofilming and control. Industrial wastes and their impact on the environment. Handling of wastes and treatment methods, wastes recycling and dumping – costs and effectiveness.

ESM 405: Environmental Protection Agencies Case Studies (2 Units)
The role of protection Agencies – from ministry of works to FEPA and ministry of Environment; roles of EPA in selected countries; Edicts and regulations. Case studies of EAR and EIA Discusses sustainable development practices.

BIO 408 Soil Ecology (2 Units) Classification and characterization of soils. Chemical components and analysis of soils and plant tissue. Plant, soil and water relationships. Physical and chemical properties of soil. Detritus organisms. Cycling of mineral and nutrient pool.

ESM411 Population, Environment and Development (3 units)
Global view of general trends in population growth and development with emphasis on Nigeria. The course will explore the dynamic relationships between environmental and social forces from the Pleistocene to the present. Topics will include the transition of societies from hunting and gathering to agriculture, responses of early urban civilizations to environmental constraints, deforestation land degradation and desertification in ancient and modern societies. The destruction and reconstruction of new world by the old. Consideration of means to distinguish natural from anthropogenic environmental changes.

ESM 421: Elements of Land Surveying (2 units)

Principles of surveying, measurement of distance and direction, chain surveying, compass survey, plane tabling. Area measurements, correction of errors of closure, height and slope measurements. Drafting of uncontoured and contoured maps, rectangular coordinators and triangulation. Traversing with theodolites, and levelling.

ESM 422: Resources Evaluation (2 units)
Resources, Types, Resource Process, Methods of resource evaluation, geomorphological techniques in resource evaluation.

ESM 431: Environmental Health and Safety (3 Units)
Our planet, the need for environmental sustainability, Environmental legislation, Environmental

Management Systems (EMS), Environmental impact assessment, Strategic environmental assessment, Environmental audit, Cost benefit analysis, Life cycle assessment, Clean technology, Environmental risk management, Sustainable development, Health and safety policies in industries and work environments, strategies and objectives. First Aid and Techniques; burns, poison stings and bites, artificial respiration etc. Accidents; classification, causes and costs; fire and firefighting. Health and safety audits as management tools. Health and safety plans. Accidents: case studies.

ESM 435: ENVIRONMENTAL ENGINEERING SERVICES (2 UNITS)

The course will enable students to advance knowledge in engineering services and applicable installations, i.e. electricity, water supply, telephone services e.t.c.

4.1 Programme Duration:

Four years is required for those one's that came in through 100level, while three years for those that came in through Direct Entry i.e 200level.

4.2.1 Prerequisite Course, Geography, Agricultural Sciences, Economics,

4.2.2 Registration procedure.Thers is also a maximum number of credits the university can allow for registration in any given semester.

4.2.3. Opening and Closing of the Course Registration portal

4.3 Course re-registration

4.4 Add and/or Drop courses

4.5 Eligibility for Graduation

A student must register for all required courses. Failure in any of these course does not prevent graduation if the student has passed enough credits for graduation. Faiiling a required course however will affect the Grade Point Average,(GPA), because all such courses registered for will be used in computing the GPA.

4.6 Research Projects

This forms one of the core courses to be offered by all students in the department before he or she will graduate, the student present a researhable topic for approval before he or she will precide for the research work.

4.7 Mode of Submission of Projects

After completion of the research work by the student which will stickly under the supervision of a capable lecturer prefarable a PhD Holder, then supervision, the supervisor will grade the student based on some guided criteria for 100%, these scores are later been moderated by external examiners before unloading to the student result portal Grading, Moderation and

4.7.1 Grading of research projects: The project is graded over 100%

4.7.2 Mode of Submission of Projects.

After completion of the project by the student, the student submit he or her project binded copy in the study center before the project copy will be forwarded to respective faculty in the Univesity.

4.10 Degree Award Requirements

4.10.1 Compulsory and Elective Courses.

COMPULSORY COURSES: These are courses that are compulsory for all students in a given programme. A student must pass these courses before he or she will be allowed to register for courses at the next level or indeed graduate if the courses is at the highest level.

ELECTIVE COURSES: These are courses available in one's domicile university or from other schools in the university. While students are advised to work hard and pass their elective courses, they can still graduate if they have sufficient credits to do so even if they failed some electives. They should however note that the number of failed courses will eventually affect their grading, because all such failed courses will be used in computing their GPA.

4.10.2 Minimum course credits for graduation.

There is a minimum credit weight loading of courses allowed at any particular semester for academic purposes if a student is studying in the full time mode.However, the minimum number of credits one can register for in a semester in the Open learning system is still dictated by one's purse,ability and time available for study.

4.10.3 General Studies Courses (GST).

Regardless of the academic programme at the undergraduate level and to some extent postgraduate level, in which a student is enrolled, all first year undergraduate students must register for and pass some general courses. These are GST courses. If a student fails any of these, he or she would not be allowed to graduate. These courses are: Study Skills 1 and 11

Use of English and Communication Skills

History and Philosophy of Science

People and Culture

Computer Fundamentals

Logic and Creative Thinking

Nigeris and her Neighbours

The Good Study Guide.

Compulsory General courses for Programmes in the Faculty of Sciences.

PART 5: ASSESSEMENT AND EVALUATION

5.2 Tutor Marked Assignments (TMA)

5.2.1 Opening and Closing of TMA portal. The TMA portal is open by CIT Department of the University after when the registration of the courses by both returning and fresh students for the semester has ended.Its also closed some few weeks to the end of the semester.

5.3 End-of-Semester Examinations

5.3.1 The eExamination.AS the name implies its conducted electronically via all study centers, and been supervise by team of invigilators which most of them are Professors for quality sake, the examination consist of 120 questions, which include 60 FILL IN THE BLANK and 60 MCQ respectively.The examination is also marked electronically,then the scores are harvested by the DMIS/DEA, which later will be uploaded into student portal.

5.3.2 Pen-on-Paper (PoP) Examinations.This is conducted every end of semester, each department in her faculty set pen on paper examination questions from the course materials already issued to the respective students that have also been registered, usually, it contained 6 (six) questions for 3units courses and 5 (five) questions for 2units courses, the examinations is marked over 70% since there is an outstanding of 30% already done as TMA on the cause of the semester before examination.Its process of marking is by conference marking all over some designated centres in the country.

B.Sc. ENVIRONMENTAL MANAGEMENT AND TOXICOLOGY

Programme Code:

1. Philosophy, Aims and Objectives of the Degree Programme

The philosophy of the programme is in the training of Personnel to the highest academic standard in the identification and resolution of environmental issues through flexible learning, defined by individual's pace. The programme will provide skilled manpower, trained specifically for environmental surveillance, monitoring and management as against the present practice where these tasks were performed by people trained in Basic and Applied Sciences.

The programme is designed to provide the training needed for an understanding of the environment and to build upon this foundation by exploring in some depths, specific aspect such as resource depletion, recycling, re-use and the impact of Science and Technology on the environment.

2. Admission and Graduation Requirements

Admission into the programme may be through any of the following modes:

* **UME**: Candidates who have successfully completed the Senior Secondary School or its equivalent and obtained five credits in Mathematics, English Language, Chemistry and Biology or Agricultural Science, in not more than two sittings and candidates must also have at-least a pass in Physics.

* **Direct Entry**: Candidates who fulfill above requirements and who have obtained G.C.E Advanced Level, HSC or equivalent passes in Biology and Chemistry may be admitted at the 200 level of the programme.

* **Special Admission**: A candidate who fulfills normal admission requirements and in addition holds ND or HND certificate (minimum upper credit) in Health Technology, Agriculture and other related fields, can be considered for admission into the programme at the appropriate level.

Transfer Cases: Candidates wishing to transfer from one programme to Environmental Management and Toxicology for some good reason(s) may be considered for absorption at

the appropriate level. Any deficiencies in their background should be rectified by taking appropriate courses.

To qualify for the award of the degree of Bachelor of Environmental Management and Toxicology, a student:

(a) Must have spent minimum of 3, 4 or 5 years on the programme depending on the year of entry.

(b) Must have passed all the University Compulsory courses.

(c) Must have passed all Faculty and Departmental Core courses, and required electives.

3. Learning Outcomes

a) Regime of Subject Knowledge

The degree will provide students with the knowledge and understanding required by today's Environmental Scientists, with career opportunities in Environmental Management, Environmental Toxicology, Research, Consultancy, Policy and Environmental Protection.

b) Competencies and Skills

The degree programme emphasizes the importance of integrating Biology, Ecology, Chemistry, Physics, Geography etc, in order to understand the Science of human impact on the environment, and how these need to be applied within the context of social, legal and political frameworks to resolve some of the major environmental issues facing the world.

c) Behavioural Attitude

Graduates of Environmental Management are governed by their code of professional conduct of the professional body. These attributes relate to:

The ability to discharge professional obligations to members of the public

Display of professional integrity

Competence with General Ethics

Compliance with the Regulation of Society

Participation in Professional Environmental Management

4. Attainment Levels

Graduates of Environmental Management and Toxicology are expected to have the ability to apply knowledge and skills to solving theoretical and practical problems in the environment relating to pollution, degradation and waste management.

100 LEVEL

FIRST SEMESTER

COURSE CODES	COURSE TITLES	Unit	Status
BIO 101	General Biology I	2	C
BIO 191	General Biology Practical I	1	C
CHM 101	Introductory Inorganic Chemistry I	2	C
CHM 103	Introductory Physical Chemistry I	2	C
CHM 191	Introductory Chemistry Practical I	1	C
ECO 121	Principles of Economics	2	C
MTH 101	General Mathematics I	3	C
PHY 101	Elementary Mechanics, Heat and Properties of Matter	3	C
PHY 191	Introductory Physics Laboratory I	1	C
GST 101	Use of English and Communication Skills	0	C
GST 105	History and Philosophy of Science	0	C
GST 107	The Good Study Guide		C
	TOTAL	17	

SECOND SEMESTER

COURSE CODES	COURSE TITLES	Unit	Status
BIO 102	General Biology II	2	C
BIO 192	General Biology Practical II	1	C
CHM 102	Introductory Organic Chemistry	2	C
CHM 192	Introductory Chemistry Practical II	1	C
CIT 104	Introduction to Computer Science	2	C
ESM 102	The Nigerian Environment	2	C
ESM 112	Introductory Ecology	2	C
MTH 102	General Mathematics II	2	C
PHY 102	Electricity, Magnetism and Modern Physics	2	C
PHY 192	Introductory Physics Laboratory II	1	C
GST 102	Use of English and Communication Skills II	0	C
	TOTAL	17	

200 LEVEL

FIRST SEMESTER

COURSE CODES	COURSE TITLES	Unit	Status
BIO 203	General Physiology I	2	C
BIO 213	Chemistry of Amino Acids and Proteins	2	C
BIO 215	General Biochemistry Laboratory I	1	C
BIO 217	General Microbiology	2	C
CHM 205	Inorganic Chemistry II	2	C

CHM 203	Organic Chemistry II	2	C
CHM 201	Physical Chemistry II	2	C
CIT 237	Programming and Algorithms	3	C
ESM 231	Introductory Toxicology	2	C
GST 201	Nigerian Peoples and Culture	0	C
GST 203	Introduction to Philosophy and Logic	0	C
	TOTAL	18	

SECOND SEMESTER

COURSE CODES	COURSE TITLES	Unit	Status
BIO 206	Statistics for Agricultural and Biological Sciences	2	C
BIO 216	Chemistry of Carbohydrates, Lipids and Nucleic Acid	2	C
BIO 281	General Biochemistry Laboratory II	1	C
CHM 202	Analytical Chemistry I	2	C
ESM 204	Environmental Hazards and Disaster Management	3	C
ESM 212	Tropical Climatology	2	C
ESM 222	Water Resource Evaluation	2	C
ESM 236	Environmental Microbiology	2	C
GST 202	Fundamentals of Peace Studies and Conflict Resolution	0	C
	Elective	2	
	TOTAL	18	

ELECTIVES

COURSE CODES	COURSE TITLES	Unit	Status
ESM 221	Ecotourism	2	E
ESM 234	Soil Resources	2	E

300 LEVEL

FIRST SEMESTER

COURSE CODES	COURSE TITLES	Unit	Status
BIO 304	General Ecology	2	
EMT 301	Principles of Natural Resources Management	2	
EMT 307	Environmental Pollution Studies	3	
EMT 309	Environmental Geosciences	2	
EMT 311	Remote Sensing and Mapping Techniques	3	
ESM 341	Introduction to Instrumentation, measurement and Field Methods in Environmental Science	2	
GST 301	Entrepreneurial Studies	0	
	Electives	2	
	TOTAL	17	

ELECTIVES

COURSE CODES	COURSE TITLES	Unit	Status
ANP 201	Introductory Biotechnology	2	E
ESM 345	Applied Climatology	2	E

SECOND SEMESTER

COURSE CODES	COURSE TITLES	U	Status
EMT 300	Environment, Ecosystem and Management	2	C
EMT 304	Hazardous Substance Management	2	C
BIO 308	Biogeography	2	C

ESM 342	Environmental Impact Assessment and Auditing	3	C
ESM 346	Environmental Planning and Management	2	C
SLM 305	Soil Chemistry, Fertility and Microbiology	3	C
	Electives	4	C
	TOTAL	18	

ELECTIVES

COURSE CODES	COURSE TITLES	U	Status
ANP 314	Environment and Animal Production	2	E
ECO 292	Environmental Economics	2	E
EMT 308	Environmental Aspects of Pesticides and other Toxicants Usage	2	E
ESM 326	Oceanography	2	E

400 LEVEL (Environmental Management Option)

FIRST SEMESTER

COURSE CODES	COURSE TITLES	Unit	Status
EMT 401	Environmental Monitoring System and Techniques	3	C
EMT 403	Environmental Aspect of Farming System	3	C
EMT 405	Environmental Education and Awareness	2	C
EMT 409	Soil Analysis	1	C
EMT 411	Water Analysis	1	C
EMT 417	Scientific Writing and Presentation in Environmental Science	2	C

EMT 421	Rural and Urban Regional Planning	2	C
ESM 407	Geographic Information System	3	C
	Electives	2	E
	TOTAL	19	

ELECTIVES

COURSE CODES	COURSE TITLES	Unit	Status
ESM 421	Elements of Land Surveying	2	E
ESM 435	Environmental Engineering Services	2	E

400 LEVEL (Environmental Toxicology Option)

FIRST SEMESTER

COURSE CODES	COURSE TITLES	Unit	Status
EMT 401	Environmental Monitoring System and Techniques	3	C
EMT 403	Environmental Aspects of Farming Systems	3	C
EMT 405	Environmental Education and Awareness	2	C
EMT 407	Principles of Toxicology I	3	C
EMT 409	Soil Analysis	1	C
EMT 411	Water Analysis	1	C
CHM 314	Environmental Chemistry	2	C
EMT 417	Scientific Writing and Presentation in Environmental Science	2	C
	Elective	2	E

	TOTAL	19	

ELECTIVES

COURSE CODES	COURSE TITLES	Unit	Status
ESM 421	Elements of Land Surveying	2	2
ESM 435	Environmental Engineering Services	2	2

SECOND SEMESTER (Both Environmental Management and Toxicology Options)

COURSE CODE	COURSE TITLES	Unit	Status
EMT 400	SIWES Industry Supervisor's Grading	3	C
EMT 402	SIWES NOUN Field Supervision Grading	3	C
EMT 404	SIWES Logbook Entries	3	C
EMT 406	SIWES Report	3	C
EMT 408	SIWES Post Field Seminar Presentation	3	C
EMT 410	Field Trip in Environmental Science	3	C
	TOTAL	18	

500 LEVEL (Environmental Management Option)

FIRST SEMESTER

COURSE CODES	COURSE TITLES	Unit	Status
EHS 308	Environmental Biotechnology	3	C
EMT 501	Environmental Laws and Policies	2	C
EMT 507	Seminar	2	C

EMT 511	Ecological Disasters and Control	3	C
EMT 521	Environment Sociology	3	C
EMT 523	Environmental Health and Safety Management	3	C
	Elective	3	E
	TOTAL	19	

ELECTIVES

COURSE CODES	COURSE TITLES	Unit	Status
EMT 429	Integrated Resources Management	3	E
EMT 517	Forestry and Wildlife Policy, Law and Administration	3	E
ESM 423	Hydrology and Water Resources	3	E

SECOND SEMESTER

COURSE CODES	COURSE TITLES	Unit	Status
EMT 504	Waste Management	3	C
EMT 506	Human Settlement and Development	3	C
EMT 510	Biodiversity Conservation	3	C
CHM 311	Petroleum Chemistry	2	C
EMT 599	Project	4	C
	Electives	3	E
	TOTAL	18	

ELECTIVES

COURSE CODES	COURSE TITLES	Unit	Status
EMT 520	Tourism and Recreation	3	E

EMT 522	Environment and Community Health	3	E
SLM 512	Fertilizer Technology	3	E

500 LEVEL (Environmental Toxicology Option)

FIRST SEMESTER

COURSE CODES	COURSE TITLES	Unit	Status
CHM 406	Nuclear and Radio Chemistry	2	C
EHS 308	Environmental Biotechnology	2	C
EMT 501	Environmental Laws and Policy	2	C
EMT 503	Principles of Toxicology II	2	C
EMT 505	Principles of Analysis of Toxicants	3	C
EMT 507	Seminar	2	C
EMT 509	Structural Elucidation of Organic Pollutant	3	C
	Elective	2	E
	TOTAL	18	

ELECTIVES

COURSE CODES	COURSE TITLES	Unit	Status
EMT 523	Environmental Health and Safety Management	3	E
EMT 511	Ecological Disasters and Control	3	E
SLM 509	Waste Management and Soil	2	E

SECOND SEMESTER

COURSE CODES	COURSE TITLES	Unit	Status
CHM 306	Instrumental Methods of Analysis	2	C
CHM 413	Analytical Chemistry II	2	C

EMT 504	Waste Management	3	C
EMT 512	Petroleum and Environment	2	C
EMT 514	Miscellaneous Techniques in Environmental Analysis	2	C
EMT 599	Project	4	C
	Electives	3	E
	TOTAL	18	

ELECTIVES

COURSE CODES	COURSE TITLES	Unit	Status
EMT 506	Human Settlement and Development	3	E
EMT 510	Biodiversity Conservation	3	E
EHS 506	Environmental Health Laws, Regulations and Policies	3	E
SLM 512	Fertilizer Technology	3	E

TOTAL CREDIT UNITS FOR CORE AND ELECTIVE COURSES IN ENVIRONMENTAL MANAGEMENT AND TOXICOLOGY

Management Option

	CORE COURSES	**ELECTIVE COURSES**	**TOTAL**	**Sum of Level 1st and 2nd Semester**
100 LEVEL				
First Semester	17	0	17	
Second Semester	17	0	17	**34**
200 LEVEL				
First Semester	17	0	17	
Second Semester	15	2	17	**34**
300 LEVEL				
First Semester	16	2	18	
Second Semester	14	4	18	**36**
400 LEVEL				
First Semester	17	2	19	
Second Semester	18	0	18	**37**
500 LEVEL				
First Semester	15	3	18	**36**
Second Semester	15	3	18	
TOTAL	**161**	**16**	**177**	**177**

COURSE SYNOPSIS

EMT 300: Environment, Ecosystems and Man (2 Units)

Population, community, ecosystem, environment and environmental factors. Study of communities and ecosystem, abundance, density, yield, cover, frequency. The ecology of niche, niche, overlap competition coexistency, resource shift. Habitats: The primary terrestrial and aquatic habitats which affect man. Alteration imposed on the habitats by man. Integration of ecology and environment into development planning. Ecological management. Ecodevelopment and integrated development. Environmental planning principles: inter-disciplinary not multidisciplinary, holistic, comprehensive, participative coordinated, integrated and continuous planning.

EMT 301: Principles of Natural Resources Management (2 Units)

Natural resources types and origin, environment, resource and development; rational use of resources and concept of sustainable development. Management of forests, grazing, lands, soils, foods, minerals, etc. Community resource development, population and pressure on resource utilization, administration and management of natural resource in Nigeria. Resource economics and management. Environmental conservation – Protection of nature and conservation of species. Conservation of agricultural landscape. Case studies concerned with concepts of balanced approach to natural resources management. Development of planning and management principles of natural resources and ecosystem subject to increasing development processes.

EMT 304: Hazardous Substances Management (3 Units)

The nature, origin and classification of hazardous toxic substances; Characteristics of wastes and hazardous substance,. Identification of hazardous substances. Sources and pathways of hazardous substances. Disposal methods and technology of hazardous substance. Geological environmental factors affecting choice of disposal site; contamination of water bearing strata; soil, plants, food webs and bio-concentration. Analysis of hazardous and toxic substances. Regulations and law governing the sale, importation, transportation, storage and disposal of hazardous and toxic substances.

ESM 341: Introduction to Instrumentation, Measurements and Field Methods In Environmental Science (2 units)

Description of instruments for measuring air quality i.e. NO, O_2, CO, Relative air humidity e.t.c Noise level etc. Water, soil measuring instruments, corrosivity, resistance, PH, Conductivity, BOD e.t.c. Instrumentation and parameters for measuring wastewater prior to discharge; potable water for safe drinking. Ecological Sampling techniques, measurement of properties and quality of water, soil and air.

EMT 307: Environmental Pollution Studies (3 units)

Composition of air, Requirements for air quality, source of pollutants and noise. Threshold levels of pollutants, physical and Chemical changes in air resulting from domestics and industrial wastes. Mitigation and remediation methods. General description of land and water resources – with emphasis on economic aspects. Sources of pollutants. Impact of specific pollutants on ecosystems. Mitigation and remediation methods.

EMT 308: Environmental Aspects of Pesticide and Other Toxicants Use (3 Units)

Movement and absorption of pesticides in soil. Factors affecting mobility of pesticides and other toxicants in the soil. Soil Herbicide interaction and herbicide efficacy. Famigant action and systematic activity. Pesticide conversion mechanisms in the environment. Enzymic and non-enzymic conversion, degradation of pesticides and other toxicants in soil, water, plants and in animals. Pesticides in food chains. Detection/determination and management of toxic wastes in the environment, sanitary fundamentals of pesticide application, safely measures in storage, dispensing, transportation and use of pesticides; disposal of pesticide containers and wastes ecological and environmental health effects. Environmental criteria standards, regulations on pesticidal hoe. Case studies of global disasters of misuse and abuse of pesticides.

EMT 309: Environmental Geosciences (2 units)

Scope and meaning of environmental science; the concept of the earth's surface as the home of man; atmosphere and atmospheric processes; hydrosphere and the hydrological cycle; the lithosphere and the process of sculpturing the earth's surface; the lithosphere and the biological productivity of the earth's surface; the earth surface in natural history; the current environmental concern and environmental hazards.

EMT311: Remote Sensing and Mapping Techniques (3 Units)

Principles of remote sensing, Image analysis and interpretation. Nigeria SAT 1. Remote sensing applications in environmental studies. History of air photo photography, flight height, instruments for air photo interpretation. Issues and problems in air photography in the tropics. Maps and their limitations. Projections and their properties. Qualities of Projections for Nigerian maps. Base maps, Cartographic instruments, analysis of physical and human features in topographical maps. Analysis of areas and linear properties of drainage basins. Slope analysis; analysis of geological maps, settlement analysis, and transport pattern.

EMT 401: Environmental Monitoring Systems and Techniques (3 Units)

Definition, general principles of environmental monitoring. Organisation of monitoring programmes for site and resource specific strategies. Classification of monitoring techniques and use (physical, chemical, biological radioactive) global sources, sinks and transport (mass balance) of both man-made and natural atmospheric trace components, Ocean-atmosphere interactions, reversible effect of human activities on the global environment e.g. green house effect, climate change, depletion of stratosphere ozone layer, acid rain. Air pollution meteorology, chemistry and biology. Atmosphere dispersion models. Elements of air pollution control. Sampling and air monitoring techniques. Mechanism of pollutant interaction with soil and vegetation. General principles of biotesting, aquatic toxicity, types, bio, assays, data analysis and interpretation.

EMT 403: Environmental Aspects of Farming Systems (3 Units)

Farm systems and farming systems. The relevance of the farm-system approach. Classification of farming systems. Difficulties of farming systems. Problems and peculiarities of shifting cultication. Characteristics and problems of permanent upland cultivation. Irrigation farming. Environmental and health implication of irrigation. Perrenial crop farming. Ranching. Institutional and environmental requirements of site related systems.

EMT 405: Environmental Education and Awareness (2 Units)

Population and environment (responsible use). Role of educational intervention in environmental action. Methods of dissemination of environmental information; case studies of information to various target groups. Methods of public opinion assessment. Social theory for environmental psychology, ecological, psychology theory of participation, social response to environmental-pollution, environmental damage and compensation.

EMT 407: Principles of Toxicology I (3 Units)

History of toxicology, Biochemistry cellular and molecular toxicology. Biotoxins, carcinogenesis, tertratogenesis and mutagenesis/genetic toxiology, biotransformation of toxicants. Systematic toxicology, toxic responses of blood, liver, kidney, respiratory systems, central nervous systems, skin, reproductive system, eye and the immune systems.

Practicals: Demonstration to topical application contract tests, systemic activity of pesticides. Acetycholinesterases inhibition in insects in VICO and in VITRO. Inhibition of egg hatch in nematodes and chitindeposition in insects.

Resistance tests in insects. Probit analysis. Effect of gamma irradiation on insect development studies. Effect of morphogenic agents on larval and pupa development in insects. Autoradiographic studies. Bioassay of resistant/susceptible strains of insects, audiovisuals.

EMT 409: Soil Analysis (1unit)

Types of laboratory chemicals, analytical instruments and principles of operation (colorimeter, flame analyzer, atomic absorption spectrophotometers, pH meter); Soil sampling and sample preparation; nitrogen and phosphorus determinations in soil; potassium analysis in soil. Evaluation of analytical data, special techniques and precautions in micronutrient analysis; features and functions of a standard soil-testing laboratory.

EMT 411: Water Analysis (1 Unit)

Sampling and analysis of water for various biological and physico-chemical water quality parameters: PH, hardness, alkalinity, chlolride, phosphate, nature, ammonia, sulphate, sulphide, sulphite, fecal bacteria, etc. Determination of dissolved oxygen (D.O), chemical oxygen demand (COD), biochemical (BOD) dissolved and suspended solids, conductivity, turbidity, temperature, saturation index, sodium adsorption ration, etc.,

EMT 417: Scientific Writing and Presentation in Environmental Science (3 units)

Elements of research, research design, Hypothesis formulation and testing, sampling techniques and Data sources, research proposal, thesis writing.

EMT 421: Rural and Urban Regional Planning (3 units)

Urban growth and the rural-urban synergies; overcrowding and social disruption; the city as a source of environmental degradation; housing development; new management policies and strategies for urban liveability; human space, population and world resources. Policy and policy thrusts for rural development in Nigeria 1900 to present day. Development needs of rural societies. Community development and roles of NGOs. Rural/urban migration. Urbanization of rural societies.

EMT 429: Resources Evaluation (2 units)

Resources, Types, Resource Process, Methods of resource evaluation, geomorphological techniques in resource evaluation.

EMT 501: Environmental Laws and Policies (2 units)

Basic concept of environmental standard criteria and regulation. Federal environmental laws organisation of environment protection. States edict and regulation on the environment, plant and animal quarantine. Regulations and enforcement mechanisms, violations and sanctions. Comparative study of environmental laws in some advance countries. e.g. USA, Canada, Thiland, etc. International Laws and conventions.

EMT 503: Principles of Toxicology II (2 Units)

Sources, fate and effects of different toxicants in the environment; pesticides, metals, radiation and radioactive materials, plant and animal toxins, polyhalogenated compounds, hazardous wastes, dusts, asbestos, plastics. Factors that influence toxicity, route of administration, chemical and biological factors. Environmental toxicology, food additives and contaminants, atmospheric, aquatic and soil pollutants. Clinical toxicology, cosmetics and drugs, occupational toxicology and health. Autoradiography. Toxicity testing. Future of toxicology in the developing countries i.e. regulatory and legal requirements.

EMT 504: Waste Management (3 Units)

Types, nature and characteristics of toxicants, sampling of air, soil, water and other ecological materials particularly using a staplex sampler at different flow rates and other modern methods. Sample preservation and preparation techniques. Samples collection techniques of air, soil, water, food, blood etc. Analytical methods for toxicants. Instrumental neutron.

Activation analysis. Atomic absorption spectrophotometer UV/Visible spectrophotometer. Gas chromatograph hybrid methods e.g. GC/Mass spectrometer. Auto-analyzer chemical separation methods. Gas analyzers. Quality assurance of analytical data statistical treatment of data. Interpretation of data.

EMT 505: Principles of Analysis of Toxicants (3 Units)

Types and forms of wastes. Sources of waste. Methods of solid, liquid and gaseous wastes management technology including wastes recycling and utilization. Institutional arrangements for waste management. Environmental health effects of waste management. Economics of wastes management, wastes management strategies. Case studies.

EMT 506: Human Settlement and Development (3 Units)

Human settlements, size and density. Factors influencing location, landscape designs, parks and reserves. Rural, urban land use and environmental quality. Culture and environment: patterns, health and safety. Environmental ethics. Impact of human settlement and development on the environment

Case studies: examples of significant human settlements and developments projects and their environmental impacts.

EMT 507: Seminar (2 Units)

The purpose of this course is to familiarize the students with effective use of the library, preparation of project reports, papers for journal publication and journal reviews. Students will be given essays on topics of general interest from widespread areas of environmental management.

EMT 509: Structural Elucidation of Organic Pollutants

Structural elucidation of organic pollutants, basic instrumentation and techniques. Applications of ur, ir, n, m, r, and m, s in chemical analysis and structural elucidation of organic pollutants.

EMT 510: Biodiversity Conservation 3 units

Loss of biological diversity and environmental pollution. Basic ecological and evolutionary principles underpinning efforts to conserve the earth's biodiversity. These principles will be examined in the context of efforts to halt the rapid increase in disappearance of both plants and animals. Some sociological and economic issues will be treated with emphasis on biological aspects of the crucial problems and case studies.

EMT 511: Ecological Disasters and Control (3 Units)

Ecological consequences of mismanagement of natural resources. Principles and practice of greebelt establishment in arid coastal areas. Origin causes of erosion. Erosion forecasting surface water management. Soil hydrology. Soil water movement. Drainage, leaching and water disposal. Economics and benefits of erosion control. Mechanics of erosion. Types and forms of erosion. Evapo-transportation. Erosion/food control measures, engineering and administrative measures.

EMT 512: Petroleum and Environment (2 units)

Origin and composition of crude oil, composition of refund oils; extent, sources fate and effects of oil in the environment. Characteristic of biogenic and petrogenic hydrocarbons control of oil pollution. Oil pollution monitoring , sampling, sample containers, extraction, clean-up, identification and quantitation, oil tagging. Use of bio-indicators in oil pollution monitoring. Biomarkers.

EMT 514: Miscellaneous Techniques in Environmental Analysis (2 Units)

Miscellaneous advanced techniques in environmental analysis X-ray methods, neutron activation and radiochemical methods, enzymatic and kinetic methods, automated and process analyzers.

CHM 406: Nuclear and Radiochemistry (2 Units)

Natural radioactivity, fusion, fission, decay process, nature of radiation. Nuclear models, energetic of nuclear reaction. Principles and measurement of radioactivity. Applications of radioactivity. Radiation Hazards.

CHM 413: Analytical Chemistry II (2 Units)

Theory of error-significance round correlation tests. Potentiometer and pH titrations. Conductometric methods, electrolytic methods, radiochemical methods. Chromatography Calorimetry.

EMT 517: Forest and Wildlife Policy, Law and Administration (2 Units)

Forest, wildlife and related natural resources, policies, planning effective use of forest resources, structure of wildlife administration, problems of conserving forest and endangered species. Nigeria law in natural resources management. Administration and wildlife conservation for economic and recreation uses, problems of wildlife conservation in Nigeria.

CHM 306: Instrumental Methods of Analysis (2 Units)

Spectroscopic techniques, physicochemical optical; flame and X-ray methods. Fluorence method, magnetic resourance and electron spin resonance. Referchemistry and interferometry . florerimentry, polarography , calorimetry.

EMT 521: Environmental Sociology (3 Units)

Impact of culture on the environment. The sacred forests (sacred groves) their original and functions including conservation values, protective role of culture (e.g. tradition including taboos) on plant and animal diversity and conservation. Effects of pollution, policy and education on the environment (e.g. Land use decree and Structural Adjustment Programme). Socioeconomic and cultural roles of conservation programme.

EMT 523: Environmental Health and Safety Management (3 Units)

Human activities and the environment; Healthy housing Unit; Food safety and hygiene; Air hygiene; Adequate and safe water supply; Waste management and disposal; Vector control; Role of environmental health professionals. Our planet, the need for environmental sustainability, Environmental legislation, Environmental Management Systems (EMS), Environmental impact assessment, Strategic environmental assessment, Environmental audit, Cost benefit analysis, Life cycle assessment, Clean technology, Environmental risk management, Sustainable development, Health and safety policies in industries and work environments, strategies and objectives. First Aid and Techniques; burns, poison stings and bites,

artificial respiration etc. Accidents; classification, causes and costs; fire and firefighting. Health and safety audits as management tools. Health and safety plans. Accidents: case studies.

EMT 599: Project (4 Units)

Investigation of an environmental research problem.

Other Courses

ANP 201: Introduction to Biotechnology (2 Units)

Nucleic acids, nucleotides and nucleosides; structure and function of DNA and RNA. Translation into proteins, the genetic code, DNA errors and repair. Genes; Gene structure, function, replication, expression; Gene repair, mutation, recombination and cloning; Principles of DNA recombination. Molecular Tools/Techniques. Biotechnology application in animal agriculture: DNA probes, transformation of microorganisms, recombinant DNA vaccines, transformation of animals. Other biotech applications: Delivering peptides and enzymes, Targeting rumen protozoa, developing a new feed additive, Reducing Phosphorus Pollution, Pathogens in manure and the environment. Improving fibre digestion.

Practical: Extraction of DNA and RNA from animal tissues; in vitro translation, transcription, recombination and cloning

ANP 314: Environment and Animal Production (2 Units)

Concept of the environment; components of the environment, climate change and the environment; environmental degradation and its consequences; effect of climate factors on farm animals (survival, performance, and productivity); special topics will include global warming, greenhouse gas emission, pollution, erosion, desertification, stratospheric ozone, environment control; physiological factors contributing to heat load in farm animal; global view on the environment.

BIO 101: General Biology I (2 units)

Characteristics of living things; cell as the basic unit of living things; cell structure, organisation, cellular organelles, tissues, organs and systems. Classification of living things, general reproduction and concept of interrelationships of organisms. Heredity and evolution; Elements of ecology (introduction) and habitats.

BIO 102: General Biology Ii (2 Units)

Systematic studies of diversity of life including monera, protista, plants (Algae, Fungi, Bryophytes,

Pteridophytes, Gymnosperms and angiosperms) and animals (Protozoa, Platyhelminthes, Annelids, Arthropods, Fishes, Amphibians, Reptiles, Birds and Mammals) based on similarities and differences in external morphology. Taxonomic divisions of plant and animal kingdoms. Ecological adaptations of these forms.

BIO 191: General Biology Practical I (1 unit)

What practical biology in biology involves. Laboratory organisation. Handling Common Laboratory equipment; Microscopic handling and maintenance; Making microscopic measurement; Procuring animal materials for practical; Killing, preserving and maintaining animal materials; Procuring plant materials; External features of plants (differences and similarities); Preparation of temporary slides; Preparation of strains and reagents; Techniques for microbial culture and grain staining; Setting up demonstration for physiological processes in plants; Setting up apparatus for demonstrating physiological processes in animals. Preparation required for dissection.

BIO 192: General Biology Laboratory II (1 Unit)

Observation and description of the morphological and diagnostic features as well as the differences among the different phyla of the plant, animal, archebacteria, eubacteria, fungi and protista kingdoms. Identification of the taxonomic hierarchy of the members of the above groups. Study of the structure and functions of their parts and habitats specifications.

BIO 203: General Physiology I (2 Units)

Physical and chemical processes in animals and plants; diffusion, osmotic pressure and osmolarity. Water potential, turgor, plasmolysis, Gibbs-Donan relationship. Gas exchange, partial pressures (Tension), Hydrogen-ion concentration (Ph). Henderson Hasselbach equation, buffers in physiology. Nutrition; photo-autotrophism, heterotrophism (essential requirements of each), Respiration and photosynthesis; RQ and QIO in relation to metabolism, photosynthesis, oxygen and carbon dioxide exchange.

BIO 205: Introductory Developmental Cell Biology (3 Units)

History and present trends in cell biology. Reproductive cell division, differentiation and growth of cells. Molecular basis of cell structure and development. Proteins and nucleic acids.

BIO 206: Statistics For Agriculture And Biology (2 Units)

Use of statistical methods in Biology and Agriculture. Continuous and discrete variables, Sampling procedure. Sample size. Presentation of statistical results. Frequency distribution. Law of probability, the binomial, Poisson and normal frequency distributions. Estimations and Tests of Hypothesis. Design of simple Agricultural and Biological experiments. Analysis of variance and co-variance, simple regression and corelation, contingency tables, some non-parametric tests. The use of statistical packages such as SPSS and Minitab in statistical analysis.

BIO 213: Chemistry of Amino Acids And Proteins (2 Units)

Structure, properties and classification of amino acids, pH, pka and buffer, peptide. Reactions of

specific amino acids, separation of sequence of peptides, chemistry of proteins including their structural level and types of bonds stabilizing them, properties, functions and classifications of proteins, enzymes, vitamins and co-enzymes

BIO 215: General Biochemistry Laboratory I (I Unit)
Introduction to laboratory and laboratory equipment. Safety, housekeeping, washing and drying of glassware in the laboratory. Accuracy of measurement and transfer of liquids and solids. Introduction to photometry and colorimetry. Standard curve in absorption spectra. pH and buffer systems. Qualitative and quantitative tests for amino acids and proteins. Biuret method and estimation of proteins.

BIO 216: Chemistry of Carbohydrates, Lipids and Nucleic Acids (2 Units)

Classification of physical properties of carbohydrates, structure of glucose, projection and perspective formular, structure of properties of other monossacharides, brief treatment of dissacharides and polyssacharides. Chemistry, classification and properties of lipids. Methods of analysis of lipids, lipoprotein, membrane and membrane structure. Chemistry of nucleic acids (Bases, Sugar and Phosphate acid). Structure and roles of RNA and DNA

BIO 217: General Microbiology (3 Units)
Historical aspects, scope of microbiology, general characteristics of microorganisms, growth and reproduction of microorganisms; sterilization and disinfection; brief survey of microbes as friends and foes. Systematic classification of bacteria fungi, viruses, etc. Microbial variation and heredity; biological and biochemical reactions of microorganisms; cycles of elements in nature; Nitrogen fixation.

BIO 218: General Biochemistry Laboratory Ii (I Unit)
General texts in concentration, Reaction of carbohydrate, thin layer of chromatographic separation of sugar. Estimation of glucose in biological fluid (blood and urine). Analysis of lipids for double bond and free fatty acids. Separation by thin layer chromatography. Separation and purification of nucleic acids. Estimation of DNA and RNA. Estimation of phosphate and titratable acidity.

BIO 304: General Ecology (2 Units)
The ecosystem approach to the study of ecology. Types of interaction. Energy flow and nutrient cycling, population structure, population dynamics: birth and death rate, life tables and longevity. Communities in ecosystem. Influence of man.

BIO 308: Biogeography (2 Units)

Distribution of world flora, floristic regions of the world and zoogeographic regions of the world, comparision of tropical and temperate flora, dispersal and colonization of land by plants and animals, island biogeography, relationships between vegetation, soil types and climate, relationships between plant distribution and world fauna

CHM 101: Introductory Inorganic Chemistry (2 units)

Hypothesis, theory and law with appropriate illustrations, Nature of matter – 3 states of matter, Atomic structure, electronic energy levels and orbital. Periodic classification of elements and its relationship to their electronic configurations, Chemical bonding, Survey of properties and trends in groups I, II, IV, VI and transition metal,

CHM 102: Introductory Organic Chemistry (2 units)

Simple reactions of hydrocarbons, alcohols, and acids. Petroleum chemistry, Oils and fats, hydrogenation of oils, polymer and biologically important molecule.

CHM 103: Introductory Physical Chemistry I (2 units)

Mole concepts and calculations based on it. Methods of expressing concentration. Chemical kinetics and equilibria and related calculations. Important application of equilibria. PH, solubility products and solubility of ionic solids. Thermo Chemistry and simple calculations based n Hess's law. Electro Chemistry and working of various cells. Brief mention of corrosion, Chemical thermodynamics, oG = oH – ToS.

CHM 191: Introductory Practical Chemistry I (1 Unit)

Practical based of CHM 101 and CHM 103: Cations and anions – identification, Acid- base titrations, Redox reactions and determinations

CHM 192: Introductory Practical Chemistry Ii (1 Unit)

Practical based on general chemistry CHM 101 and introductory organic chemistry I CHM 102- Determination of melting and boiling points and reaction of functional groups.

CHM 201: Physical Chemistry Ii (2 Units)

Kinetic theory of gases, behaviour of real gases; The laws of thermodynamic Entropy and free energy, reactions and phrase equilibrium; reaction rate laws for gases where the concentration of the reactions are the same. Mechanism and theories of unimolecular reactions.

CHM 202: Analytical Chemistry I (2 Units)

Theory of errors, statistical treatment of data; Theory of sampling, chemical methods of analysis including volumetric (acid base,, oxidation – reduction, precipitation and complexiметry); Physicochemical methods (Optical methods of analysis – UV/V), separation methods. pH notation and buffer solutions. Gravimetry solubility product and its application to separation methods of metals.

CHM 203: Organic Chemistry II (2 Units)

Factors affecting structure and physical properties of organic compounds; Factors affecting availability of electrons, Stereo-chemistry; Energy of activation and free radical substitution reactions in alkenes.

Functional group chemistry. Electrophillic and nucleophillic substitution reactions. Aromaticity. Various type of organic reactions; e.g. addition, free radical, elimination and substitution reactions.

CHM 205: Inorganic Chemistry II (2 Units)

Chemistry of first row transition metals. Introduction to co-ordination Chemistry including elementary treatment of crystal field theory. Comparative Chemistry of the following elements: Ga, In, TI, (b) Ge, Sn, Pb, (c) As, Sb, Bi (d) Se, Te, Po. Elementary introduction to Organometalic Chemistry. Role of metals in biochemical Systems

CHM 314: Environmental Chemistry (2 Units)

Concepts of elementary cycles. Characteristics of the atmosphere. Sources, types and effects of environmental pollution. Waste water treatment. Composition of domestic wastes. Water chemistry and analysis. Chemical and Physical instrumentation in environmental sciences.

CIT 104: Introduction to Computer Science (2Units)

What is a computer?; types of computer; history of digital computer; elements of a computer: Hardware and software; How to work with a computer; Operating system; Windows Files: word processing, copying a text, saving, changes to a document, formatting, spelling checker and introduction to printing a document; Spreadsheet: entering and correcting data, using formula, numeric formats, creating charts, types of chart, power points and presentations. Networking: internet and email, reading and responding to an electronic mail message.

CIT 237: Programming and Algorithms (3 Units)

The programme development process, programme design, coding, and testing principles of good programming styles; Programme verification techniques; Programme documentations and maintenance; Programme design tools, e.g. flowcharts, pseudo codes, etc. Illustration of the various concepts with practical programming problems of manageable complexity e.g. Knight's tour or 8-queens, life game problems, etc. Algorithms and data structures; Divide-and-conquer algorithms; Stacks, queues, trees. A treatment of popular sorting and searching algorithms; performance analysis of algorithms. Worst-, best- and average-case performance of the algorithms. Recursion, Hill-climbing techniques.

ECO 121: Principles of Economics 2 units

Basic Concepts in Economics; Fundamental Principle of Economics; Economics and Basic Economics Problems; The Economics System; Demand and Supply; The Basis Decision-making; Demand and Supply; Price Determination, Market Equilibrium, Price Ceiling and Price Floor, Elasticity of Demand, Elasticity of supply. Theory of Consumer Behavior; Basis of Choice: Utility, Budget Constraint, Equilibrium, price and income changes. Theory of Production. Production Process and Cost Concepts. Law of Production. Theory of Firm; Perfect Competition, Monopoly, Monopolistic competition and oligopoly, Market Structure Comparison.

ECO 292: Environmental Economics (2 units)

Key concepts in microeconomics, applications to management of renewable and non-renewable natural resources. Cost and benefit weighed for major environmental problems including global warming, toxic wastes, water and air pollution and conservation of wilderness and biodiversity; issues of social externalities.

EHS 308: Environmental Biotechnology (3 units)

Concept and Definition of Biotechnology; Origin, History and Development of Biotechnology; Classification of Biotechnology; Scope of Environmental Biotechnology; Methods in Biotechnology; Concept and Definition of Methods; Methods Used in Environmental Biotechnology; Traditional and Modern Methods in Environmental Health; Application of Biotechnology to Environmental Health; Application of Biotechnology to Waste Management; Biological and Traditional Control of Pests and Diseases; Application of Biotechnology to Food Production and Preservation; Application of Biotechnology to Air and Water Pollution Control; Application of Biotechnology to Remediation of Contaminated Sites; Merits and Demerits of Biotechnology.

EHS 506: Environmental Health Laws, Regulations and Policies 2 units

History of Environmental Health Laws, Regulations and Policies; Nature and Sources of Laws; Morality; Judicial Institution in Nigeria; Process of Making Laws; Court Processes and Procedures; Process of Compelling Attendance of Accused Person in Court; Constitutional Rights and Safeguards of the Accused Person; Public Health Laws; Environmental/Public Health Offences; Enforcement Roles of Environmental Health Officers; Environmental Health Officers Registration Council of Nigeria; National Environmental Standard Regulations Enforcement Agency.

ESM 102: The Nigerian Environment (1 unit)

General description of the natural, physical features of Nigeria: Vegetation, climate and climatic changes within the geographical expression; Geographical distribution of people and natural recourses. Brief description of economic importance of these features. Exploration and exploitation of natural resources. Brief impact of these on the environment

ESM 112: Introductory Ecology (1 unit)

General consideration of ecosystems including influence and interaction of human beings with their environments. Similarities, differences of ecosystems. Characteristics and ecological adaptations of various forms life.

ESM 221: Ecotourism (2 units)

The concept of ecotourism; ecotourism as sustainable (responsible) tourism; resources for ecotourism in Nigeria; ecotourism and the impact on the environment; planning and development of ecotourism destinations; geographical information systems as planning tool; communities and eco-destinations; ecotourism projects in Nigeria.

ESM 231: Introductory Toxicology (2 units)

General description of toxicology, toxicity, toxins and hazardous Chemical assay, dose – response curve, Chemical statistics and their applications. Sources, types and effects of toxins. Cancer and cancer trends in Nigeria.

ESM 204: Environmental Hazards and Disaster Management (3 units)

Hazard and risk management, Risk assessment of environmental hazards. Types of hazards, occurrence, impacts, prevention. Disaster management strategies for both short term and long term.

ESM 212: Tropical Climatology (2 units)

Meaning and scope of climatology and tropical climatology; the nature of the atmosphere; elements of weather and climate, radiation, temperature, precipitation; tropical climate; weather and climatic hazards in the tropics; physiological comfort; climate and urban planning in the tropics; tropical disturbances; tropical agro-climatology.

ESM 222: Water Resource Evaluation (2 units)

Water resources; sources and distribution; approaches to water resources evaluation; qualitative and quantitative approaches; water balance approach; need for evaluation; methods of measuring rainfall; analysis and interpretation of rainfall data; evapotranspiration measurements; stream flow measurements – stage, discharge-velocity, hydrographs analysis, flow variability and recession; hydrology of reservoirs. Water quality measurement and analysis – solute, suspended, bed load and yield.

ESM 234: Soil Resources (2 units)

Scope and nature of soil resources; physical and chemical properties of soils; soil formation, soil profile, soil classification; progress in soil mapping in Nigeria; soil determination; methods of soil survey; laboratory determination of soil properties – particle size distribution; bulk density, total porosity, PH, organic matter content, available phosphorous.

ESM 236: Environmental Microbiology (2 units)

General characteristics of microorganisms in the environment Sterilization and disinfection. Structure, ecology and reproduction of selected common microorganisms. Isolation of bacteria, fungi and viruses. Antigens and antibodies. Economic importance of some microbial groups.

ESM 328: Biodiversity Conservation (2 Units)

Loss of biological diversity and environmental pollution. Basic ecological and evolutionary principles underpinning efforts to conserve the earth's biodiversity. These principles will be examined in the context of efforts to halt the rapid increase in disappearance of both plants and animals. Some sociological and economic issues will be treated with emphasis on biological aspects of the crucial problems and case studies.

ESM342: Environmental Impact Assessment and Auditing (3 Units)

Origin and Evolution of Environmental Impact Assessment (EIA), Theory and practice of Environmental Impact Assessment, EIA legislation EIA process, Environmental Audit Process, Environmental Audit Report; (EAR) as management tools. Environmental Policy and compliance. Environmental Governance, Institutional framework for environmental management. Preparation of EIA report, methods of executing EIA. Selected case studies of EIA around the world.

ESM 345: Applied Climatology (2 units)

Application of Climate to Industry, Agriculture, Aviation, building and human settlements; weather modification and their implication; Acid rain, econoclimate, Drought, flood, climate change and human affairs.

ESM 407: Geographic Information System (3 Units)
Principles of GIS; GIS applications in Environmental Management, ARC Info, ARC view and other GIS packages.

ESM 410: **Field Trip in Environmental Science (3 units**)

Fundamentals of field principles and measurements including dumpsites, land fill/land reclamation, marine pollution, flood or drought, erosion site, waste management/recycling, forestry/forest conservation schemes. Field studies of manufacturing/Industrial sectors, Climatic/Meteorological Stations, rural/ urban environment as well as environmental impact assessment of projects. Studies are guided by Department / approved Facilitator. At the end of the trip, student writes and submits technical report to be graded.

ESM 421: Elements of Land Surveying (2 units)

Principles of surveying, measurement of distance and direction, chain surveying, compass survey, plane tabling. Area measurements, correction of errors of closure, height and slope measurements. Drafting of uncontoured and contoured maps, rectangular coordinators and triangulation. Traversing with theodolites, and levelling.

ESM 423: Hydrology and Water Resources (3 units)

Definition and scope of hydrology; trends in hydrology; the hydrological cycle and the approaches to its study; the drainage basin as a hydrologic unit; precipitation, interception, infiltration and soil moisture evaporation and evapo-transpiration; runoff and floods; the hydraulic and mechanic of flood; runoff generation, contributing areas. Morphometry and runoff frequency: erosion by water on hill slope, sediment transport processes.

ESM 435 Environmental Engineering Services (2 UNITS)
The course will enable students to advance knowledge in engineering services and applicable installations, i.e. electricity, water supply, telephone services e.t.c.

GST 101: Use of English and Communication Skills I

Listening enabling skills, listening and comprehending comprehension, note taking and information retrieval. Including data, figures, diagrams and charts. Listening for main idea, interpretation and critical

evaluation. Effective reading. Skimming and scanning. Reading and comprehension at various speed levels. Vocabulary development in various academic contexts. Reading diverse texts in narratives and expository. Reading and comprehension passages with tables, scientific texts. Reading for interpretation and critical evaluation.

GST 102: Use of English and Communication Skills II (2 Units)

Writing paragraphs; Topic, sentence and coherence;Development of paragraphs; illustration; Description; cause and effect including definitions;Formal letters: essential parts and stylistic forms; complaints and requests;jobs;ordering goods; letters to government and other organisations; writing reports; reporting events, experiments, writing summaries.

GST 105: History and Philosophy of Science (2 units)

General description of the nature of science and basic scientific methods and theories; history of western science and science in ancient times, middle ages and the rise of modern science; an overview of African science; man and his environment and natural resources; nature, scope and technological development and inventions; great scientist of Nigerian origin.

GST 107: The Good Study Guide (2 units)

Getting started, reading and note taking; other ways of studying, working with numbers. What is good writing? How to write essays. Preparing for examinations.

GST 201: Nigerian Peoples and Cultures (2 units)

History of traditional Nigerian peoples and culture : the pre-colonial history and the culture areas of Nigeria; the evolution of the country as a political unit. How to analyze and understand people's cultures from a historical, sociological and anthropological angle.

GST 202: Fundamentals of Peace Studies & Conflict Resolution (2 Units)

Basic Understanding of Conflict; Definitions, Causes and Types of Conflict, Conflict Theories, Phases in Conflict, Conflict Analysis & Transformation. Dynamics of Conflict; Relationship between Perception and Conflict, Language Barriers in Conflict and Resolution, Early Warning and Early Response Mechanism, Arms Control and Demilitarization, Peace and Education. Trends in Global Issues: International, Continental and Regional Organizations in the Pursuance of World Peace, Peaceful Methods of Conflict Resolution, Coercive Means of Conflict Resolution, Gender Issues and Humanitarian Intervention.

GST 203: Introduction to Philosophy and Logic (2 units)

General introduction to logic; clarity of thought, expression and arguments as basis for conclusions; fundamentals of logic and critial thinking; types of discourse; nature of arguments; validity and soundness; techniques for evaluating arguments; distinction between inductive and deductive inferences; etc. Illustrations from familiar texts, including literature materials, novels, law reports and newspaper publications.

GST 301: Entrepreneurial Studies (2 units)

MTH 101: General Mathematic I (3 Units)

Elementary set theory, subsets, union, intersection, complements, Venn diagrams; Real numbers; integers, rational and irrational numbers, mathematic I, induction real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; Algebra of complex numbers; the Argand Diagram; Re Moivre's theorem; nth roots of unity. Circular measure; trigonometric functions of angles of any magnitude, addition and factor formalae

MTH 102: General Mathematics II (3 Units)

Calculus: Function of a real variable, graphs, limits and idea of continuity. The derivative as limit of rate of change; Techniques of differentiation; Extreme curve sketching; Integration as an inverse of differentiation; Methods of integration, Definite integrals; Application to areas, volumes.

PHY 101: Elementary Mechanic, Heat and Properties of Matter (3 Units)

Heat and temperature, work and heat, Quantity of heat: heat capacities, latent heat; Thermal expansion of solids, liquids and gases; Gas laws, heat transfer; Laws of thermodynamics, isothermal and adiabatic changes, Carnot cycle; Application to kinetic theory of gases; Simple kinetic theory of gases, the van der Waals gas. Classification of matter into (solids, liquids and gases, forces between atoms and molecules, molecular theory of matter, Elasticity, plasticity, Hook’s Law, Young’s Shear and bulk Moduli) Crystalline and non-crystalline materials, Hydrostatics: pressure, buoyancy, Archimedes' principle; Hydro-dynamics-streamlines, Bernouli and continuity equations, turbulence, Reynold’s number, Viscosity, laminar flow, Poiseuille’s equation; Surface tension, adhesion, cohesion, capillary, drops and bubble

PHY 102: Electricity, Magnetism and Modern Physics (2 Units)

Electrostatics: Coulomb’s law, Gauss’s law, potential and capacitance, dielectrics, production and measurement of static electricity. Current: Ohm's law, resistance and resistivity, heating. Galvanometers, Voltmeters and Ammeters; D.C. circuits: sources of emf and currents, Kirchhoff’s laws; Electrochemistry; The Earth's magnetic field; Magnetic fields and induction, Faraday's and Lenz's laws; Force on a current-

carrying conductor. Biot-Savart law. Flemming's right and left-hand rules, motors and generators. A.C. Theory. Atomic structure; Production and properties of X-rays; Radioactivity; Photoelectric emission.

PHY 191: Introductory Practical Physics I (1 Unit)

Graphs, Measurement, Error Analysis, Determination of Acceleration due to Gravity by Means of Simple Pendulum, Determination of force constant of a spiral spring, Determination of effective mass of a spiral spring and the constant, Determination of surface tension of water, Determination of specific latent heat of fusion of ice, Determination of the co-efficient of limiting static friction between two surfaces, Determination of the co-efficient of static friction on two surfaces using an inclined plane, Determination of Relative Density of kerosene using the specific Gravity Bottle, Determination of the Relative Density of a Granular substance not soluble in water using the specific gravity bottle.

PHY 192: Introductory Practical Physics II (1 UNIT)

Refraction through the glass block; Image formed by a concave mirror; Determination of the focal length of the convex mirror; Refraction through the triangular prism; Determination of the focal length of a converging lens and the refractive index of groundnut; Determination of resistance of resistors in series and in parallel in simple circuits; Determination of internal resistance of a dry cell using a potentiometer; To compare the E.M.F. of cells using potentiometer; Determine the unknown resistance of a resistor using Wheatstone Bridge; To determine the relationship between current through a Tungsten and a potential applied across it.

SLM 305. Introductory Soil Chemistry, Fertility and Microbiology: (3 Units)

Soil phases; availability of soil nutrients, cation exchange capacity and base saturation; soilacidity and liming; nutrient movement in soils; nutrient uptake mechanisms; chemistry, status and availability of essential nutrients in soils. Microorganisms in soil-kinds, number and activities; role of microorganisms in plant growth; the dynamic nitrogen and phosphorus pools; organic matter-sources, transformation and functions in soil.

SLM 509: Waste Management and Soil (3 Units)

Properties of agricultural, municipal and industrial wastes; exchange, sorption and precipitation cs_3' reactions in soil; soil biota; site selection. Economic considerations; decomposition of

organic residues; rates of waste application; composting; recycling C and N; soluble-salt considerations; food chain accumulations of metals and health implications; environmental quality problems.

SLM 512: Fertilizer Technology (3 Units)

Fertilizer terminologies; importance of fertilizers in agriculture, history of fertilizer consumption, compositions of macro and micronutrient fertilizer sources, calculation of fertilizer rates and methods of application; manufacture of fertilizers with special reference to phosphorus and potassium; chemical and physical methods of assessing fertilizer materials.

DEPARTMENT OF MATHEMATICS

1.0 **ACADEMIC STAFF FOR THE PROGRAMME**

NAME OF ACADEMIC STAFF	AREA OF SPECIALIZATION	DISCIPLINE	QUALIFICATION	RANK
Dr. Saheed.O. Ajibola	Vibration	Mathematics	PhD.	Associate Professor
Mrs. Christie Y. Ishola	Numerical Analysis	Mathematics	MSc.	Lecturer I
Dr. Akeem B. Disu	Computational Dynamics of Physiological Fluid in Human Body.	Mathematics	PhD.	Lecturer II
Mr. Olalekan Ogundipe	Statistics	Mathematics	MSc.	Asst. Lecturer

2.0 LIST OF PROGRAMMES AND CODES

PROGRAMME NAME	PROGRAMME CODE
a) BSc. Mathematics	5208
b) BSc. Mathematics with Computer Science	5209

3.0 PROGRAMME PHILOSOPHY

i) BSc. Mathematics

The BSc. Mathematics programme is designed to equip the undergraduate students with the basic requirements for serving in a professional capacity in most areas of computation Mathematics as well as develop knowledge in the theory of applied Mathematics. The degree programme would explore all the basic rudimentary or foundation knowledge of computing technology not known to most of today's Mathematicians and Engineers. It is also expected to equip students with the tools for computational techniques and thinking, as they would be exposed to the fundamentals of computing processes and principles.

ii) BSc. Mathematics with Computer Science

PHILOSOPHY

To enhance access of our students to continuous educational development having regards to application of Mathematical tools to solve Computer Science and Technology related challenges, while ensuring sustainability of students' relevance in the larger society.

4.0 ADMISSION AND GRADUATION CRITERIA

i) BSc. Mathematics

ADMISSION REQUIREMENT: BSc MATHEMATICS.

100 LEVEL		**200 LEVEL**
Five credits in the SSCE/GCE O'Level/NECO/NABTEB or equivalents at not more than two (2) sittings		100 level O/L requirement and any of:
Compulsory	**2 others from**	**OND**
English Language	Chemistry	Lower Credit in
Mathematics	Biology	Mathematics

Physics	Agricultural Science	Statistics
	Health Science	Computer science
	Economics	Engineering Courses
	Technical Drawing	
	Geography	**HND**
		Lower Credit in
		Mathematics
		Statistics
		Computer science
		Engineering Courses
		A-LEVELS
		MATHEMATICS C
		4 POINTS FROM ANY OF PHYSICS CHEMISTRY AND BIOLOGY
		NCE
		MERIT IN MATHEMATICS RELATED COURSES
		FIRST DEGREE
		3rd Class & above in
		Mathematics
		Statistics
		Computer Science
		Physics
		Any Engineering Degree
		CITY AND GUILDS
		minimum of intermediate certificate

GRADUATION CRITERIA

Entry Mode: 100 Level

Minimum of 120 credit units made up of ALL Compulsory courses and/or Electives as contained in the Registrable Courses for BSc. Mathematics with Computer Science

Entry Mode: Direct (200 Level)

Minimum of 90 credit units made up of ALL Compulsory courses and/or Electives as contained in the Registrable Courses for BSc. Mathematics with Computer Science

ii) BSc. Mathematics with Computer Science

ADMISSION REQUIREMENT: BSc MATHEMATICS & BSc MATHS/COMPUTER SC.

100 LEVEL		**200 LEVEL**
Five credits in the SSCE/GCE O'Level/NECO/NABTEB or equivalents at not more than two (2) sittings		100 level O/L requirement and any of:
Compulsory	**2 others from**	**OND**
English Language	Chemistry	Lower Credit in
Mathematics	Biology	Mathematics
Physics	Agricultural Science	Statistics
	Health Science	Computer science
	Economics	Engineering Courses
	Technical Drawing	
	Geography	**HND**
		Lower Credit in
		Mathematics
		Statistics
		Computer science
		Engineering Courses
		A-LEVELS
		MATHEMATICS C
		4 POINTS FROM ANY OF PHYSICS CHEMISTRY AND BIOLOGY

		NCE
		MERIT IN MATHEMATICS RELATED COURSES
		FIRST DEGREE
		3rd Class & above in
		Mathematics
		Statistics
		Computer Science
		Physics
		Any Engineering Degree
		CITY AND GUILDS
		minimum of intermediate certificate

GRADUATION CRITERIA FOR BSc.Maths/Computer

Entry Mode: 100 Level

Minimum of 120 credit units made up of ALL Compulsory courses and/or Electives as contained in the Registrable Courses for BSc. Mathematics with Computer Science

Entry Mode: Direct (200 Level)

Minimum of 90 credit units made up of ALL Compulsory courses and/or Electives as contained in the Registrable Courses for BSc. Mathematics with Computer Science

5.0 AIMS AND OBJECTIVES

i) BSc. Mathematics

Aim

The B.Sc. Mathematics programme is aimed at taking you through the fundamental of the sciences of computation and the latest technologies that make the application of Mathematical science an all-round catalyst in the design of any new market driven technological designs and devices without the constraints of face to face teaching.

Objectives:

- Be able to interact with various computational techniques and devices characterizing today's workplace.
- To produce numerates individuals who not only have or make success in their callings but also contribute to the economic buoyancy of the Nigerian economy.
- Be able to formulate solutions to Mathematical problems in institutions.
- Also be able to manage data transmission procedures and security parameters and controls.
- Be able to administer various topologies for effective communication networks.

ii) BSc. Mathematics with Computer Science

Aim

The B.Sc. Mathematics with Computer Science as a combined honours programme is aimed at taking you through the fundamental of the sciences of computation and the latest technologies that make the application of Mathematical and Scientific Models an all-round catalyst in the design of any new emerging market driven technological designs and devices without the constraints of face to face teaching.

Objectives:

- Be able to interact with various computational techniques and devices characterizing today's workplace.
- To produce numerates individuals who not only have or make success in their callings but also contribute to the economic buoyancy of the Nigerian economy.

- Be able to formulate solutions to Mathematical Solutions to Computer Science problems in institutions.
- Also be able to manage data transmission procedures and security parameters and controls.
- Be able to administer various topologies for effective communication networks.

6.0 PROGRAMME OPP/DPP

i) BSc. MATHEMATICS - OPP

100 Levels 1st Semester

Course Code	Course Title	Unit(s)	Status
BIO101	General Biology I	2	C
BIO191	General Biology Practical I	1	C
CHM101	Introductory Inorganic Chemistry	2	C
CHM103	Introductory Physical Chemistry	2	C
CHM191	Introductory Practical Chemistry I	1	C
CIT104	Introduction to Computer Science	2	C
GST101	Use of English and Communication Skills	0	C
GST105	History and Philosophy of Science	0	C
GST107	The Good Study Guide	0	C
MTH101	Elementary Mathematics I	3	C
MTH103	Elementary Mathematics II	3	C

PHY101	Elementary Mechanics, Heat and Properties of Matter	2	C
PHY191	Introductory Practical Physics I	1	C
	Total Credit Units	**19**	

2nd Semester

Course Code	**Course Title**	**Unit(s)**	**Status**
BIO102	General Biology II	2	C
BIO192	General Biology Practical II	1	C
CIT102	Software Application Skills	2	C
CHM102	Introductory Organic Chemistry	2	C
CHM191	Introductory Practical Chemistry II	1	C
GST102	Use of English and Communication Skills II	0	C
MTH102	Elementary Mathematical II	3	C
STT102	Introductory Statistics	2	C
PHY102	Electricity, Magnetism and Modern Physics	3	C
PHY192	Introductory Physics Laboratory II	1	C
	Total Credit Units	**17**	

Note: Students that failed the "old" former

- MTH 121, MTH 131 should register for MTH 101
- MTH 142, MTH 133 should register for MTH 103
- MTH 121, MTH 112 should register for MTH 102
- MTH 102 should register for STT 102

(i.e. Matriculation not earlier than 2014 (NOU14…)).

200 Level - 1st Semester

Course Code	Course Title	Unit(s)	Status
CIT215	Introduction to Programming Languages	3	C
GST201	Nigerian Peoples and Culture	0	C
MTH211	Abstract Algebra	3	C
MTH213	Numerical Analysis I	3	C
MTH241	Introduction to Real Analysis	3	C
MTH281	Mathematical Methods I	3	C
STT211	Probability Distribution I	3	C
	Total Credit Units	18	

Students to choose one elective

PHY207	Thermodynamics	2	E
PHY201	Classical Dynamics	3	E
	Total Credit Units Electives Courses	**2/3**	

200 Level - 2nd Semester

Course Code	Course Title	Unit(s)	Status
GST202	Fundamentals of Peace Studies and Conflict Resolutions	0	C
MTH212	Linear Algebra II	3	C
MTH232	Elementary Differential Equation	3	C
MTH210	Introduction to complex analysis	3	C

MTH251	Mechanics	3	C
MTH282	Mathematical Methods II	3	C
	Total Credit Units	**15**	

Students are to choose at one elective

PHY204	Electrodynamics	2	E
PHY206	Optics I	2	E
	Total Credit Units Electives Courses	**2**	

300 Level – 1st Semester

Course Code	**Course Title**	**Unit(s)**	**Status**
GST301	Entrepreneurial Studies	0	C
MTH301	Functional Analysis I	3	C
MTH304	Complex Analysis I	3	C
MTH311	Calculus of Several Variables	3	C
MTH341	Real Analysis	3	C
MTH381	Mathematical Methods III	3	C
MTH303	Vector and Tensor Analysis	3	C
	Total Credit Units	**18**	

Students are to choose at least one elective

MTH307	Numerical Analysis II	3	E

STT311	Probability Distribution II	3	E
	Total Credit Units Electives Courses	**3**	

2nd Semester

Course Code	**Course Title**	**Unit(s)**	**Status**
MTH302	Elementary Differential Equation II	3	C
MTH305	Complex Analysis II	3	C
MTH308	Introduction to Mathematical Modeling	3	C
MTH312	Abstract Algebra II	3	C
MTH382	Mathematical Methods IV	3	C
	Total Credit Units	**18**	

Students are to choose one elective

MTH309	Optimization Theory	3	E
MTH315	Analytical Dynamics I	3	E
	Total Credit Units Electives Courses	**3**	

400 Level - 1st Semester

Course Code	**Course Title**	**Unit(s)**	**Status**
MTH401	General Topology I	3	C
MTH411	Measure Theory and Integration	3	C
MTH421	Ordinary Differential Equation	3	C
MTH423	Integral Equation	3	C
	Total Credit Units	**12**	

Students are to choose at least one elective

MTH417	Electromagnetic Theory	3	E
CIT425	Operation Research	3	E
	Total Credit Units Electives Courses	3	

400 Level - 2nd Semester

Course Code	**Course Title**	**Unit(s)**	**Status**
MTH402	General Topology II	3	C
MTH412	Functional Analysis II	3	C
MTH422	Partial Differential Equation	3	C
MTH499	Project	6	C
	Total Credit Units	**15**	

Course Description

BIO 101 GENERAL BIOLOGY I (2 UNITS)

General characteristics, similarities, differences, distribution and economic importance of virus, Bacteria, fungi, lower green vascular plants. Ecological adaptation of various plant forms. Interrelationship of plants evolution and reproduction

BIO 191 GENERAL BIOLOGY PRACTICAL I (1 UNIT)

What practical work in biology involves. Laboratory organization. Handling common laboratory equipment. Microscopic handling and maintenance. Making microscopic measurements. Procuring animal materials for practicals. Killing, preserving and maintaining animal materials. Procuring plant materials. External features of plants (differences and similarities). Preparation of

temporary slides. Preparation of stains and reagents. Techniques for microbial culture and grain staining. Setting up demonstration for physiological processes in plants. Setting up apparatus for demonstrating physiological processes in animals. Preparation required for dissection.

BIO 102 GENERAL BIOLOGY II (2 UNITS)

Systematic studies of diversity of life including monera, protista, plants (Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and angiosperms) and animals (Protozoa, Platyhelminthes, Annelids, Arthropods, Fishes, Amphibians, Reptiles, Birds and Mammals) based on similarities and differences in external morphology. Taxonomic divisions of plant 0and animal kingdoms. Ecological adaptations of these forms.

BIO 191 GENERAL BIOLOGY PRACTICAL I (1 UNIT)

What practical work in biology involves. Laboratory organization. Handling common laboratory equipment. Microscopic handling and maintenance. Making microscopic measurements. Procuring animal materials for practicals. Killing, preserving and maintaining animal materials. Procuring plant materials. External features of plants (differences and similarities). Preparation of temporary slides. Preparation of stains and reagents. Techniques for microbial culture and grain staining. Setting up demonstration for physiological processes in plants. Setting up apparatus for demonstrating physiological processes in animals. Preparation required for dissection.

BIO 192 GENERAL BIOLOGY LABORATORY II (1 UNIT)

Observation and description of the morphological and diagnostic features as well as the differences among the different phyla of the plant, animal, archebacteria, eubacteria, fungi and protista kingdoms. Identification of the taxonomic hierarchy of the members of the above groups. Study of the structure and functions of their parts and habitats specifications

CHM 101: INTRODUCTORY INORGANIC CHEMISTRY (2 UNITS)

Hypothesis, theory and law with appropriate illustrations, Nature of matter – 3 states of matter, Atomic structure, electronic energy levels and orbital. Periodic classification of elements and its relationship to their electronic configurations, Chemical bonding, Survey of properties and trends in groups I, II, IV, VI and transition metal.

CHM 102: INTRODUCTORY ORGANIC CHEMISTRY (2 UNITS)

Simple reactions of hydrocarbons, alcohols, and acids. Petroleum chemistry, Oils and fats, hydrogenation of oils, polymer and biologically important molecule.

CHM 103: INTRODUCTORY PHYSICAL CHEMISTRY (2 UNITS)

Mole concepts and calculations based on it, methods of expressing concentrations, Chemical Kinetics and equilibrium, and related calculations, Important application of equilibrium – pH, solubility products and solubility of ionic solids, Thermo chemistry and simple calculations based on Hess's law, Electrochemistry and working of various cells, Brief mentions of corrosion; chemical thermodynamics; $\Delta G = \Delta H - T\Delta S$

CHM 191: INTRODUCTORY PRACTICAL CHEMISTRY I (1 UNIT)

Practical based of CHM 101 and CHM 103: Cations and anions – identification, Acid- base titrations, Redox reactions and determinations

CHM 192: INTRODUCTORY PRACTICAL CHEMISTRY II (1 UNIT)

Practical based on general chemistry CHM 101 and introductory organic chemistry I CHM 102- Determination of melting and boiling points and reaction of functional groups.

CIT 101: COMPUTERS IN SOCIETY (2 UNITS)

Introduction to Basic concepts of the Computer System; A survey of various uses of the Computer; Computer applications in the Modern Society; Effects of Computerization of the Workplace; Computer Ethnics and Security Issues, Classical examples of the effects of the internet on the society.

CIT 102: APPLICATION SOFTWARE SKILLS (2 UNITS)

Brief description of computer system: CPU, I/O devices; Operating systems; Computer File Management; Computer Software: overview, types, etc.; Application software: common application software; Using Microsoft Word; Using Microsoft Excel; Features of Database Applications and Microsoft Access; Statistical Analysis Applications; Using SPSS software; Introduction to Desktop Publishing applications; Computer applications in Nursing; Computer applications in Agriculture; Managing the computer system with the Control Panel. Protection.

GST 101: USE OF ENGLISH AND COMMUNICATION SKILLS I (2 UNITS)

Listening enabling skills, listening and comprehending comprehension, note taking and information retrieval. Including data, figures, diagrams and charts. Listening for main idea, interpretation and critical evaluation. Effective reading. skimming and scanning. Reading and comprehension at various speed levels. Vocabulary development in various academic contexts. Reading diverse texts in narratives and expository. Reading and comprehension passages with tables, scientific texts. Reading for interpretation and critical evaluation.

GST 102: USE OF ENGLISH AND COMMUNICATION SKILLS II (2 UNITS)

Writing paragraphs: Topic sentence and coherence. Development of paragraphs: illustration, Description, cause and effect including definitions. Formal letters; essential parts and stylistic forms, complaints and requests; jobs, ordering goods, letters to government and other organizations. Writing reports; reporting event, experiments. Writing summaries: techniques of summarizing letters and sounds in English, vowels and consonants. Interviews, seminar presentation, public speech making, articles, concord and sentences including tenses. Gerund, participles, active, passive and the infinitive. Modal auxiliaries.

GST 105 HISTORY AND PHILOSOPHY OF SCIENCE (2 UNITS)

Nature of science, scientific methods and theories; Law of nature,; History of science. Lost sciences of Africa, science, technology and inventions. Nature and scope of philosophy in science. Man, nature and his origin. Man, environment and resources. Great Nigerian Scientists.

GST 107: THE GOOD STUDY GUIDE. (2 UNITS)

Getting started: How to use the book, why read about skills, getting yourself organised ; what is studying all about, reading and note taking; Introduction, reactions to reading, your reading strategy, memory, taking notes, conclusion. Other ways of studying: Introduction, learning in groups, talks and lectures, learning from TV and radio broadcasts, other study media. Working with numbers; Getting to know numbers, describing the world, describing with the tables, describing with diagrams and graphs; What is good writing? The Importance of writing, what does an essay look like, what is a good essay? Conclusion. How to write essays: Introduction, the craft of writing, the advantages of treating essay writing as a craft, making your essay flow, making a convincing case, the experience of writing. Preparing for examination.

GST122: INTRODUCTION TO PHILOSOPHY AND LOGIC (2 UNITS)

General introduction to logic; clarity of thought; expression and arguments as basis for conclusion. Fundamentals of logic and critical thinking, types of discourse, nature of arguments; validity and soundness ; distinction between inductive and deductive inferences etc; illustrations from familiar texts, including literature materials, novels, law reports and newspaper publications.

GST201 NIGERIAN PEOPLES AND CULTURE (2 UNITS)

Nigerian history, culture and arts in pre-colonial times; Nigerians' perception of their world; culture areas of Nigeria and their characteristics; evolution of Nigeria as a political unit; indigene/settler phenomenon; concepts of trade; economic self- reliance; social justice; individual and national development; norms and values; negative attitudes and conducts (cultism and related vices); re-orientation of moral and national values; moral obligations of citizens; environmental problems.

PHY202: MODERN PHYSICS I (3 UNITS)

Atomic structure: Experimental basis of quantum theory: Black body radiation; electrons and quanta; Charge quantization, Mass spectra, the plum pudding model, Rutherford model and Bohr models of the atom, Hydrogen spectra, Magnetic moment and Angular momentum of an atom, Electron spin, Pauli Exclusion Principle and electronic configuration, X-ray spectra, De Broglie hypothesis, the uncertainty principle; Wave-particle duality, Schrodinger's equation and simple applications; Nuclear Structure: nomenclature, binding energy and stability, Radioactivity, The radioactive series, Accelerators, Detectors. Bohr's theory of atomic structure;

GST203: INTRODUCTION TO PHILOSOPHY AND LOGIC (2 UNITS)

General introduction to logic; clarity of thought; expression and arguments as basis for conclusion. Fundamentals of logic and critical thinking, types of discourse, nature of arguments; validity and soundness ; distinction between inductive and deductive inferences etc; illustrations from familiar texts, including literature materials, novels, law reports and newspaper publications.

GST301: ENTREPRENEURIAL STUDIES I (2 UNITS)

Introduction to entrepreneurship and new venture creation; Entrepreneurship in theory and practice; The opportunity, Forms of business, Staffing, Marketing and the new venture; Determining capital requirements, Raising capital; Financial planning and management; Starting a new business, Feasibility studies; Innovation; Legal Issues; Insurance and environmental considerations. Possible business opportunities in Nigeria. knails, screws making Dyeing/Textile blocks paste making.

PHY102: ELECTRICITY, MAGNETISM AND MODERN PHYSICS (2 UNITS)

Electrostatics: Coulomb's law, Gauss's law, potential and capacitance, dielectrics, production and measurement of static electricity. Current: Ohm's law, resistance and resistivity, heating. Galvanometers, Voltmeters and Ammeters; D.C. circuits: sources of emf and currents, Kirchhoff's laws; Electrochemistry; The Earth's magnetic field; Magnetic fields and induction, Faraday's and Lenz's laws; Force on a current-carrying conductor. Biot-Savart law. Flemming's right and left-hand rules, motors and generators. A.C. Theory. Atomic structure; Production and properties of X-rays; Radioactivity; Photoelectric emission. FMT 204: Introduction to Mathematical Economics (3UNITS)

Logarithms, Exponential and Growth Mathematics. Production functions, Differential and Total derivatives, Matrix Algebra, Input-Output Analysis. Comparative Statistics. Linear Programming, Dual Programming. Games Theory.

PHY201: CLASSICAL MECHANICS I (3 UNITS)

Vector Analysis; Review of coordinate transformations; Particle kinematics and dynamics, Many particle systems; Central force: Motion in a central force field; Central-conservative forces; Kinematics in polar coordinates; Energy conservation in central-conservative force-field; Planetary Motion; Keplerian case; Rigid body dynamics. Newtonian gravitation; Conservatives and potentials; Defects of Newtonian mechanics and the essence of special relativity.

PHY202: MODERN PHYSICS I (3 UNITS)

Atomic structure: Experimental basis of quantum theory: Black body radiation; electrons and quanta; Charge quantization, Mass spectra, the plum pudding model, Rutherford model and Bohr models of the atom, Hydrogen spectra, Magnetic moment and Angular momentum of an atom, Electron spin, Pauli Exclusion Principle and electronic configuration, X-ray spectra, De Broglie hypothesis, the uncertainty principle; Wave-particle duality, Schrodinger's equation and simple applications; Nuclear Structure: nomenclature, binding energy and stability, Radioactivity, The radioactive series, Accelerators, Detectors. Bohr's theory of atomic structure;

PHY207: THERMODYNAMICS (2 UNITS)

Basic concepts of thermodynamics; Measurement of temperature; The First Law of Thermodynamics; Entropy and the Second Law of Thermodynamics; Consequences of the first

and second laws; Carnot engine; Combined first and second laws; Helmholtz and Gibb functions, Enthalpy, The thermodynamic potentials; phase transitions; Production of low temperatures and the Third Law.

MTH 101 ELEMENTARY MATHEMATICS I: (3 Units)

(ALGEBRA AND TRIGONOMETRY)

Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand Diagram. Re Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formalae.

MTH 102 ELEMENTARY MATHEMATICS III: (3 Units) PRE-REQUISITE - MTH 101

(VECTORS, GEOMETRY AND DYNAMICS)

Geometric representation of vectors in 1-3 dimensions, components, direction cosines. Addition and Scalar multiplication of vectors and linear independence. The Scalar and vector products of two vectors. Differentiation and integration of vectors with respect to a scalar variable. Two-dimensional co-ordinate geometry. Straight lines, circles, parabola, ellipse, hyperbola. Tangents, normals. Elementary Mathematics IV. Impact of two smooth sphere, and of a sphere on a smooth sphere.

MTH 103 ELEMENTARY MATHEMATICS III: (3 UNITS) CALCULUS:

Function of a real variable, graphs, limits and idea of continuity. The derivative as limit of rate of change, Techniques of differentiation, Extreme curve sketching. Integration as an inverse of differentiation, Methods of integration, Definite integrals; Application to areas and volumes

STT 102 INTRODUCTORY STATISTICS (2UNITS)

Measures of Central Tendency and dispersion, (grouped and ungrouped); mean: - arithmetic and geometric, harmonic, median, mode quartiles, deciles, modes, relative and absolute dispersion, sample space and events as sets. Finite probability space properties of probability. Statistical

independenceand conditional probability. Tree diagram. Bayes theorem. Discrete and continuous random variables. Expectation, independent Bernoulli trials. Binomial Poisson and Normaldistributions. Normal approximation to binomial and Poisson distribution, Hyper geometric.

PHY 101: ELEMENTARY MECHANICS (2 UNITS)

Physical quantities, unit and dimensions space and time, frames of reference, vestures and scalars, kinematics – straight line, line motion, vertical motion, circular motion, deviation. Dynamics – Equilibrium, work and energy, mass and momentum, laws of inertia, rotational motion, simple harmonic motion, conservation laws, simple machines, fundamental laws of statics and dynamics, Galilean invariance.

PHY 101: Elementary Mechanics, Heat and Properties of Matter (2 UNITS)

Space and Time: Physical quantities: Units and dimensions of physical quantities; Kinematics: Uniform velocity motion, uniformly accelerated motion; Dynamics: Newton's laws of motion; Impulse and Linear Momentum, Linear Collision, Newton's universal law of gravitation; Work, energy and power; Conservation laws; Concept of mechanical equilibrium; Centre of mass and centre of gravity; Moment of a force; Rotational kinematics and dynamics: Torque; Moment of Inertia; angular momentum; Total mechanical energy. Simple harmonic motion

Heat and temperature, work and heat, Quantity of heat: heat capacities, latent heat; Thermal expansion of solids, liquids and gases; Gas laws, heat transfer; Laws of thermodynamics: Isothermal and Adiabatic changes, Carnot cycle; Application kinetic theory of gases; van der Waals gas.

Classification of matter into (solids, liquids and gases, forces between atoms and molecules, molecular theory of matter, Elasticity, plasticity, Hook’s Law, Young’s Shear and bulk Moduli) Crystalline and non-crystalline materials, Hydrostatics: pressure, buoyancy, Archimedes' principle; Hydro-dynamics-streamlines, Bernouli and Continuity equations, turbulence, Reynold’s number, Viscosity, laminar flow, Poiseuille’s equation; Surface tension, adhesion, cohesion, capillary, drops and bubbles.

PHY 191: INTRODUCTORY PHYSICS LABORRATORY I (1 UNITS)

Graphs, Measurement, Error Analysis, Determination of Acceleration due to Gravity by Means of Simple Pendulum, Determination of force constant of a spiral spring, Determination of effective mass of a spiral spring and the constant, Determination of surface tension of water, Determination of specific latent heat of fusion of ice, Determination of the co-efficient of limiting static friction between two surfaces, Determination of the co-efficient of static friction on two surfaces using an inclined plane, Determination of Relative Density of kerosene using the specific Gravity Bottle,

PHY 192: INTRODUCTORY PRACTICAL PHYSICS II (1 UNITS)

Refraction through the glass block; Image formed by a concave mirror; Determination of the focal length of the convex mirror; Refraction through the triangular prism; Determination of the focal length of a converging lens and the refractive index of groundnut; Determination of resistance of resistors in series and in parallel in simple circuits; Determination of internal resistance of a dry cell using a potentiometer; To compare the E.M.F. of cells using potentiometer; Determine the unknown resistance of a resistor using Wheatstone Bridge; To determine the relationship between current through a Tungsten and a potential applied across it.

CIT 215: INTRODUCTION TO PROGRAMMING LANGUAGES (3UNITS)

FORTRAN programming language; Comparison of various versions of the language. Programming exercises using FORTRAN with emphasis on scientific application problems. Elements of Pascal language. Exercises in Pascal Program structures and programming concepts; Structured design principles; abstraction, modularity, stepwise refinement, structured design techniques teaching of a structured programming language, e.g. PASCA/JAVA, C^{++}.

MTH 210: INTRODUCTION TO COMPLEX ANALYSIS (3UNITS)

Complex number, the topology of complex plane. Limits and continuity of function of complex variables, properties and example of analytic functions, branch-points, Cauchy-Riemann equations. Harmonic function.

MTH 211: ABSTRACT ALGEBRA I (3UNITS)

Set: Binary operations, mapping, equivalence relations integers: Fundamental theorem of arithmetic, congruence equations, Euler's function (n) Group Theory: Definition and examples of groups. Subgroups, coset decomposition, Lagrange's theorem. Cyclic groups. Homeomorphisms, isomorphism. Odd and even permutations. Cayley's theorem. Rings: Definition and examples of rings. Commutative rings. Integral domain. Order, well-ordering principles. Mathematical induction.

MTH 212: LINEAR ALGEBRA II (3UNITS)

Vector spaces. Liner independence. Basis, change of basis and dimension. Linear equations and matrices. Linear maps. The diagonal, permutation, triangular matrices. Elementary matrix. The inverse of a matrix. Rank and nullity. Determinants. Adjoint, cofactors, inverse matric. Determinant rank. Crammer's rule. Canonical forms, similar matrices, Eigen values and vectors, quadratic forms.

MTH 213: NUMERICAL ANALYSIS I (3UNITS) PRE-REQUISITE - MTH 102

Interpolation: Lagrange's and Hermite interpolation formulae, divided differences and difference schemes. Interpolation formulas by use of divided differences. Approximation: Least-square polynomial approximation, Chebychev polynomials continued fraction and rational fraction orthogonal polynomials.

Numerical Integration: Newton's-cotes formulae, Gaussian Quadrature. Solution of Equations: Graffe's method (iterative method) Matrices and Related Topics: Definitions, Eigenvalue and Eigenvectors, Algebraic Eigenvalue problems-power method, Jacobi method.

Systems of linear Equations: Gauss elimination, Gauss-Jordan method. Jacobi iterative method, Gauss-field iterative method.

MTH 232: ELEMENTARY DIFFERENTIAL EQUATION (3UNITS)

PRE-REQUISITE - MTH 103

Introduction, equation of first order and first degree, separable equations, homogeneous equations, exact equations, linear equations, Bernoulli's and Riccati equations. Applications to mechanics and electricity. Orthogonal and oblique trajectories. Second order equations with constant coefficients.

MTH 241: INTRODUCTION TO REAL ANALYSIS (3UNITS)

Sets: Cartesian products, functions and mappings direct and inverse images. Countable sets. Limits: Elementary properties of limits. Upper and lower bounds, supremum, infimum, convergence of sequences. Limit of monotone functions and sequences. Cauchy convergence principles. Continuity: Real-Valued functions of a real variable Monotone functions, periodic functions, bounded functions. Continuity of functions using neighborhood. Elementary properties of continuous functions. Uniform continuity. Series: convergence of series, tests for convergence, absolute convergence, power series, uniform convergence.

MTH 251: MECHANICS

Static: System of live vectors. Coyoles and wrenches. Principles of virtual work. Stability of equilibrium. Dynamics of systems of particles: Elastic strings. Hooks law. Motion in resisting media. Changing mass. Motion along a curve. Frenets formulae.

Coplanar Motion: Energy equation. Motion in a vertical circle. Simple pendulum. The cycloid and cycloidal motion. Orbital motion-disturbed orbits and stability.

MTH 281: MATHEMATICAL METHOD I (3UNITS) PRE-REQUISITE - MTH 103

Sequences and Series: Limits, continuity, Differentiability, implicit functions, sequences. Series, test for convergence sequences and series of functions. Calculus: partial differentiation, total derivatives, implicitly functions, change of variables. Taylor's theorem and maxima and minima functions, of two variables. Lagrangian multiplier. Numerical Methods: Introduction to iterative methods, Newton's method applied to finding roots. Trapezium and Simpson's rules of integration.

MTH 282: MATHEMATICAL METHODS II (3UNITS) PRE-REQUISITE - MTH 281

Vector Theory: Vector and scalar field functions. Grad, divi, curl, directional derivatives. Orthogonal curvilinear coordinates.

Complex Numbers: The algebra and geometry of complex numbers; de'moivre's theorem. Elementary transcendental functions. The n^{th} root of unity and of a general complex number.

PHY 202: MODERN PHYSICS I (3 UNITS) PREREQUISITES: PHY102

Atomic structure: Experimental basis of quantum theory: Black body radiation; electrons and quanta; Charge quantization, Mass spectra, the plum pudding model, Rutherford model and Bohr models of the atom, Hydrogen spectra, Magnetic moment and Angular momentum of an atom, Electron spin, Pauli Exclusion Principle and electronic configuration, X-ray spectra, De Broglie hypothesis, the uncertainty principle; Wave-particle duality, Schrodinger's equation and simple applications; Nuclear Structure: nomenclature, binding energy and stability, Radioactivity, The radioactive series, Accelerators, Detectors. Bohr's theory of atomic structure.

PHY 204: ELECTROMAGNETISM (2 UNITS)
PREREQUISITES:PHY102, Macroscopic properties of dielectrics: polarisation, Gauss's law in a dielectric, the displacement vector, boundary conditions on **D** and **E**, dielectric strength and breakdown; Capacitor: capacitance, the parallel plate capacitor, effect of a dielectric, energy stored in a dielectric medium, capacitors in series and parallel, practical capacitors; Microscopic properties of dielectrics: microscopic picture of a dielectric in a uniform electric field, determination of local field, Clausius-Mossotti equation, behaviour of dielectric in alternating fields; Magnetism of materials: response of various substances to a magnetic field, magnetic moment and angular momentum of an atom, diamagnetism and paramagnetism, Lamor precession, magnetization of paramagnets, ferromagnetism, magnetic field due to a magnetized material, magnetic intensity, relationship between **E** and **H** for magnetic material, magnetic circuits.

development.

PHY 206: OPTICS I (2 UNITS)

Nature of light: the corpuscular model, the wave model, light as an electromagnetic wave; Reflection and refraction of light: electromagnetic waves at the interface separating two media,

idealization of waves as light rays, Fermat's principle; Perception of light: human vision, colour vision; Polarization of light: simple states of polarized light, principles of producing linearly polarized light, wave plates.

STT 211: PROBABILITY DISTRIBUTION I (3UNITS) PRE-REQUISITE - STT 102

Discrete sample spaces: Algebra and probability of events, combinatorial analysis. Sampling with and without replacement. Conditional probability, Bayes theorem and stochastic independence. Discrete distributions: Binomial, Poisson, negative binomial-hyper geometric and multinomial. Normal approximation to binomial and Poisson, Poisson approximation to binomial. Random variables and expectations: mean, variance, covariance. Probability generating function and moment generating function. Cheycher's inequality. Continuous joint distributions: marjind as conditional density. Expectations: movement, movement generating functions. Uniform normal, beta Cauchy and hop-normal distributions.

MTH 301: FUNCTIONAL ANALYSIS I (3UNITS) PRE-REQUISITE - MTH 241

Metric Spaces – Definitions and examples. Open Sphere of (balls) closed sets, interior, exterior, frontier, limit points and closure of a set. Dense subsets and separable space. Convergence in metric space, homeomorphism, continuity and compactness.

MTH 302: ELEMENTARY DIFFERENTIAL EQUATION II (3UNITS)

PRE-REQUISITE - MTH 282

Series, solution of second order linear equations. Bessel, legendry and hyper geometric equations and functions. Gamma and Beta functions. Storm Lionvelle problems. Orthogonal polynomial and functions, Fourier, Fourier, Bessel and Fourier – legendry series. Expansion in series of orthogonal functions. Fourier transformation. Laplace transforms solution of wave and heat equations by Fourier method.

MTH 303: VECTOR AND TENSOR ANALYSIS (3UNITS) PRE-REQUISITE - MTH 103

Vector algebra, Vector dot and cross products. Equation of curves and surfaces. Vector differentiation and application. Gradient, divergence and curl. Vector integration, line, surface and volume integrals, Green stoke's and divergence theorems. Tensor products and vector spaces tensor algebra, symmetry, Cartesian tensors.

MTH 304: COMPLEX ANALYSIS I (3UNITS) PRE-REQUISITE - MTH 101

Functions of a complex variable. Limits and continuity of functions of a complex variables. Deriving the Cauchy-Riemann equations. Analytic functions. Bilinear transformations, conformal mapping. Contour Integrals, Cauchy's theorems and its main consequences. Convergence of sequences and series of functions of complex variables.Power Series, Taylor Series.

MTH 305: COMPLEX ANALYSIS II (3UNITS) PRE-REQUISITE - MTH 304

Laurent expansions, isolated singularities and residues, residue 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.

MTH 307: NUMERICAL ANALYSIS II (3UNITS) PRE-REQUISITE - MTH 213

Polynomial and Splines approximations: Orthogonal polynomials and chebychev approximations, least squares, cubes spline, Hermits approximations, Numerical Integration. Boundary value problem. Introduction to numerical solution of partial differential equations.

MTH 308: INTRODUCTION TO MATHEMATICAL MODELING (3UNITS)

Methodology of the Model building. Identification, formulation and solution of problems, cause – effect diagrams, equation types, algebraic, ordinary differential, partial differential, difference, integral and functional equations. Application of Mathematical model to physical, biological, social and behavioural sciences.

MTH 309: OPTIMIZATION THEORY (3UNITS)

Linear programming models. The simplex method, formulation and theory. Duality, integer programming. Transportation problem, two-person zero-sum games. Non – linear programming, quadratic programming Kuhn tucker methods, optimality criteria simple variable optimization. Multivariable techniques, Gradient methods.

MTH311: CALCULUS OF SEVERAL VARIABLES (3UNITS) PRE-REQUISITE - MTH 282

Value, Limit and Continuity of functions of several variables. Partial derivatives of function of several variables. Total derivative of a function. Partial Differentials and Total Differentials of $f(x,\ldots\ldots x_n))$. Composite differentiation. Fuller's Theorem. Implicit Differentiation. Taylor's Series for function of two variables. Maxima and Minima of functions of several variables. Lagrange's Multipliers. Differentials under integral sign, The Jacobians

MTH 312: ABSTRACT ALGEBRAII (3UNITS) PRE-REQUISITE - MTH 241

Normal subgroups and quotient groups. The isomorphism theorem. Symmetric groups, automorphism, conjugate classes, Normalisers. The sylow theorems. Normal and composition series. The Jordan-Holder theorem. Direct product. Solvable group. Isomorphism theorems for rings. Ideals and quotient rings. Commutative ring, maximal ideals. Euclidean rings, principal ideal domain and unique factorization domain.

MTH 315: ANALYTICAL DYNAMICS I (3UNITS) PRE-REQUISITE - MTH 251

Degrees of freedom, Holonomic and non-holonomic constraint. Generalized coordinates. LaGrange's equation for holonomic systems, force dependent on coordinates only, force obtainable from a potential, Impulsive force, variational principles, calculus of variation, Hamilton principles. Canonical transformation, normal modern of variation, Hamilton Jacobi equation.

The notion of displacement, speed, velocity and acceleration of a particles. Newton's law of notions and applications to simple problems. Work, power and energy. Application of the principle of conservation of energy to notion of particles and those involving elastic string and springs. Simple Harmonic motion. Resultant of any number of forces acting on a particle. Reduction of coplanar forces acting on a rigid body to a force and a couple. Equilibrium of coplanar forces, parallel forces, couples Laws of friction. Application of the principle of moments. Moments of Inertia of simple bodies.

MTH 318: FLUID MECHANICS I (3UNITS) PRE-REQUISITE - MTH 251

Real and Ideal fluid. Differentiation following the motion of fluids particles, Equation of continuity. Equation of motion for incompressible in viscid fluids. Velocity potential and stoke's stream function. Bernoulli's equation with applications. Kinetic Energy. Sources, sinks, doublets in 2 and 3 dimensions stream lines. Images. Use of conformal transformation.

MTH 341: REAL ANALYSES (3UNITS) PRE-REQUISITE - MTH 312

Integration: The integral as the area of the ordinate set of a function. Definition of the Riemann integral of bounded functions. Conditions for integrality. Properties of the integral. Relations between integrals and derivatives. Approximation to integrals by sum.

The Riemann Integral: Riemann-Sieltejes integral. Properties, functions of bounded variation and extension to the notion of integration. Sequences and Series of Functions: Convergence of sequences and series of functions. Uniform convergence. Continuity of sum of a uniform convergent series of continuous functions. Terms by term integration and differentiation of a series of continuous functions. Applications to power spaces metric spaces.

MTH 381: MATHEMATICAL METHODS III (3UNITS) PRE-REQUISITE - MTH 303

Functions of several variables: Jacobian, functional dependence and independence. Multiple integrals, line integrals. Improper integrals. Vector Field theory: Relations between vector field functions. Integral theorems. Gauss's. Stoke's and Green's theorems. Elementary tensor calculus. Functions of a complex variable: The Cauchy-Riemann equations. Integration of complex plane. Cauchy's theorem Cauchy's inequality. The residue theorem and the evaluation of integrals. Integral Transforms: Fourier and Laplace transforms. Convolution properties and their applications.

MTH 382: MATHEMATICAL METHODS IV (3UNITS) PRE-REQUISITE - MTH 281

Ordinary Differential Equations: The concept of existence and uniqueness of solutions. Operational methods of solution of linear equations. Sturm-Lionvelle theory, Green's functions, series solution. Special functions and some of their elementary properties; Gamma and Beta functions. Partial Differential Equations: Solutions of boundary and eigenvalue problems of partial differential equations by various methods which include: Separation of variables, transform techniques. Sturn-Liouville theory; Green's functions; method of characteristics.

STT 311: Probability Distribution II (3units) PRE-REQUISITE – STT 211

Probability spaces measures and distribution. Distribution of random variable spaces. Product probabilities. Independence and expectation of random variables. Convergence of random variables. Week convergence almost everywhere, laws of large numbers. Characteristic function and inversion formula.

STT 316: MULTIVARIATE ANALYSIS AND APPLICATION (3UNITS)

PRE-REQUISITE – STT 311

Vector random variables. Expectations of random vectors and matrices. Multivariate normal distribution and distribution of quadratic forms. Application to linear models: Tests of general linear hypothesis and estimation. Least square theory: Guass-Markoff and general linear hypothesis with applications to regression and experimental design models. Estimation: partial and multiple correction coefficients, mean vector and co-variance matrix. Hatelting's T^2 and Wishart distribution: multivariate ANOVA.

MTH 401: GENERAL TOPOLOGY I (3UNITS) PRE-REQUISITE - MTH 301

Point Set Topology: The space $\mathbf{R}^n$ Euclidean metric. Metrics, open spheres, metric topologies, metric spaces, properties of metric topologies. Equivalent metric. Heine-Borel theorem. Bolzano-wierstress theorem. Properties of separable, complete, compact, locally-compact and connected spaces. Cantor's set. Continuity and uniform continuity of mappings on metric space. Topological spaces: Definitions, examples, accumulation points, closes sets, closure, interior, exterior and boundary of a set. Neighborhoods and neighborhood systems. Coarser and finer topologies, subspaces and relatives topologies. Base for a topology sub bases.

MTH 402: GENERAL TOPOLOGY II (3UNITS) PRE-REQUISITE - MTH 401

Separation axioms: T-spaces, Hausdorff spaces, Regular spaces. Normal spaces, Urgsohn's lemma. Category and seperability: Dense sets, nowhere dense sets. Sets of the first and second categories. Perfectly separable spaces. Separable spaces. The axiom of count ability. Compactness: Covers, compact sets, subsets of compact spaces. Sequentially, count ably and locally sets. Compactification. Product spaces: product topology. Base for a finite product

topology. Tychonoff product theorem. Connectedness: separated sets, connected sets, connected spaces. Connectedness of the real line. Components. locally-connected spaces. Homotopic paths. Homotopy relations. Simple connected spaces.

MTH 411: MEASURE THEORY AND INTEGRATION (3UNITS)

PRE-REQUISITE - MTH 301

Measure Theory: Measure of open, closed sets. Outer and inner measure. Measurable sets. Properties of measure. Non-measurable sets. Measurable in the scene of Borel. Measurable space. Measurable functions. Simple function Algebra. The Lebesgue integral: Lebesgue measure. Integral of non-negative function. Integral as measure of ordinate set, as a limit of approximate sums. Integral of an unbounded function. Integral over an infinite range. Simple properties of the integral. Sequences of integral (Positive functions; functions with positive and negative values). Lesbesgue monotone convergence theorem. Fatou's Lemma, Dominated convergence. Bepo's Lemma-Bounded Convergence. Sets of measure zero. Integration by parts. Fubini's theorem and applications to multiple integrals.

MTH 412: FUNCTIONAL ANALYSIS II (3UNITS) PRE-REQUISITE - MTH 411

Normal Linear Space: Definition and examples. Convex sets. Norms. Holder's minkowski's inequalities. Riese-Fisher theorem. Linear operations on finite dimensional spaces. Linear functionals spaces. Banach spaces, examples. Quotient spaces. Inner product spaces. Topological linear spaces. Hilbert space, examples. Linear operators in Hilbert spaces. Adjoint operators. Hermitian operators. Orthogonality; orthogonal complement and projections in Hilbert spaces.

MTH 414: ANALYTICAL DYNAMICS II (3UNITS) PRE-REQUISITE - MTH 315

Lagrange's equations for non-holonomic systems. Lagrangran multipliers. Variational principles. Calculus of variation, Hamilton's principle, Lagrange's equation from Hamilton's principles. Canonical transformation Normal modes of vibrations. Hamilton-Jacobian equations.

MTH 415: SYSTEM THEORY (3UNITS) PRE-REQUISITE - MTH 341

Lyapunov theorems. Solution of Lyapunov stability equation

$A^TP + PA = -Q$. Controllability and observability. Theorems on existence of solution of linear systems of differential operations with constant coefficient.

MTH 416: ALGEBRAIC NUMBER THEORY (3UNITS)

Algebraic numbers; quadratic and cyclotomic fields. Factorization into irreducible, ideals, Murkowski's theorem, class-group and class number, Fermat's last theorem Dirichilet's unit theorem.

MTH 417: ELECTROMAGNETIC THEORY (3UNITS) PRE-REQUISITE –PHY 204

Maxwell's field equations. Electromagnetic waves and electromagnetic theory of lights. Plane detromagnetic waves in non-conducting media, reflection and refraction of plane boundary. Wave guide and resonant cavities. Simple radiating systems. The Lorentz-Einstein transformation. Energy and momentum. Electromagnetic 4-Vectors. Transformation of (E.H) fields. The Lorentz force.

MTH 421: ORDINARY DIFFERENTIAL EQUATIONS (3UNITS)

Existence and uniqueness theorems, dependence of solution on initial data and parameters. Properties of solutions. General theory for linear differential equation with constant coefficients, the two-point Sturm-Liouville boundary value problem, self-adjointness, linear and non-linear equations, Theorems and solution of Lyapunov equation. Controllability and observability.

MTH 422: Partial Differential Equation (3units) PRE-REQUISITE - MTH 421

Theory and solutions of first order equations. Second order linear equations. Classification, characteristics canonical forms, Cauchy problem. Elliptic equations. Laplace's and Poisson's formulae, properties of harmonic functions. Hyperbolic equations, retarded potential transmission line equation, Riemann methods, parabolic equation, diffusion equation, singularity function boundary value and initial value problems.

MTH 423: INTEGRAL EQUATION (3UNITS) PRE-REQUISITE - MTH 103

Integral Equation: Classification – Volterra and Fredholm types. Transformation of Differential Equations. Neumann series. Fredholm alternative for degenerate Hilbert – Schmidt Kernels. Reduction of ordinary differential equation to Integral equations. Symmetric Kernels, eigen function expansion with applications.

MTH 424: ABSTRACT ALGEBRA III (3UNITS) PRE-REQUISITE - MTH 341

Minimal polynomial of an algebraic number. Eisenstein's irreducibility criterion. Splitting fields and normal extension. Primitive element theorem. Galois group of a polynomial. Field degrees and group orders. The Galois group of a polynomial. Field degrees and group orders. The Galois correspondence. The fundamental theorem

MTH 418: FLUID MECHANICS II (3UNITS) PRE-REQUISITE – MTH 318

Governing equations of viscous flow, exact solutions, Low Reynolds's number solutions, Boundary layers, compressible flows.

MTH 499: PROJECT

Individual or Group projects of approved topics related to the current research interests in the department

BSc. Mathematics and Computer Science (Combined Honours)

BSc. Mathematics/ Computer Science Programme

100 Levels 1st Semester

Course Code	Course Title	Unit(s)	Status
BIO101	General Biology I	2	C
BIO191	General Biology Practical I	1	C
CHM101	Introductory Inorganic Chemistry	2	C
CHM103	Introductory Physical Chemistry	2	C
CHM191	Introductory Practical Chemistry I	1	C
GST101	Use of English and Communication Skills	0	C
CIT104	Introduction to Computer Science	2	C
GST105	History and Philosophy of Science	0	C
GST107	The Good Study Guide	0	C
MTH101	Elementary Mathematics I	3	C

MTH103	Elementary Mathematics II	3	C
PHY101	Elementary Mechanics, Heat and Properties of Matter	2	C
PHY191	Introductory Practical Physics I	1	C
	Total Credit Units	**19**	

2nd Semester

Course Code	**Course Title**	**Unit(s)**	**Status**
BIO102	General Biology II	2	C
BIO192	General Biology Practical II	1	C
CIT102	Software Application Skills	2	C
CHM102	Introductory Organic Chemistry	2	C
CHM191	Introductory Practical Chemistry II	1	C
GST102	Use of English and Communication Skills II	0	C
MTH102	Elementary Mathematical II	3	C
STT102	Introductory Statistics	2	C
PHY102	Electricity, Magnetism and Modern Physics	3	C
PHY192	Introductory Physics Laboratory II	1	C
	Total Credit Units	**17**	

Note: Students that failed the "old" former

- MTH 121, MTH 131 should register for MTH 101
- MTH 133, MTH 142, should register for MTH 103
- MTH 112 , MTH 122 should register for MTH 102
- MTH 102 should register for STT 102

(i.e. Matriculation number not earlier than 2014 (NOU14…)).

200 Level 1st Semester- Compulsory Courses

Course Code	Course Title	Unit(s)	Status
GST201	Nigerian Peoples and Culture	0	C
GST203	Introduction to Philosophy and Logic	0	C
CIT237	Programming and Algorithms	3	C
MTH281	Mathematical Methods I	3	C
MTH211	Introductory Set theory and Abstract Algebra	3	C
MTH213	Numerical Analysis I	3	C
MTH241	Introductory Real Analysis	3	C
	Total Credit Units Compulsory Courses	**15**	

Students to take two elective courses

CIT211	Introduction to Operating Systems	3	E
CIT215	Introduction to Programming Languages	3	E
MTH210	Introduction to Complex Analysis	3	E
	Total Credit Units Electives Courses	**3**	

2nd Semester- Compulsory Courses

Course Code	Course Title	Unit(s)	Status
GST202	Fundamentals of Peace Studies and Conflict Resolutions	0	C

MTH212	Linear Algebra II	3	C
MTH232	Elementary Differential Equations	3	C
MTH282	Mathematical Methods II	3	C
CIT208	Information Systems	2	C
CIT212	Systems Analysis and Design	3	C
CIT246	Introduction to Computer Organization	2	C
	Total Credit Units Compulsory Courses	**16**	

Students to take one elective course

CIT292	Computer Laboratory	2	E
STT211	Probability Distribution I	3	E
	Total Credit Units Electives Courses	**2/3**	

300 Level 1st Semester- Compulsory Courses

Course Code	**Course Title**	**Unit(s)**	**Status**
GST301	Entrepreneurial Studies	0	C
CIT333	Software Engineering I	2	C
CIT341	Data Structures	3	C
CIT351	C# Programming	2	C
MTH301	Functional Analysis I	3	C
MTH341	Real Analysis	3	C
	Total Credit Units Compulsory Courses	**13**	

Students to take two elective courses

CIT311	Computer Networks	3	E
CIT309	Computer Architecture	3	E
STT311	Probability Distribution II	3	E
	Total Credit Units Electives Courses	6	

2nd Semester -Compulsory Courses

Course Code	**Course Title**	**Unit(s)**	**Status**
MTH312	Abstract Algebra II	3	C
CIT342	Formal Languages & Automata Theory	3	C
CIT322	Introduction to Internet Programming	3	C
CIT389	Siwes	6	C
	Total Credit Units Compulsory Courses	**15**	

Students to take one elective course

CIT344	Introduction to Computer Design	3	E
CIT371	Introduction to Computer Graphics & Animations	3	E
	Total Credit Units Electives	**3**	

400 Level 1st Semester- Compulsory Courses

Course Code	**Course Title**	**Unit(s)**	**Status**
MTH401	General Topology I	3	C
MTH411	Measure Theory & Integration	3	C
CIT403	Seminar on Emerging Technologies	3	C

CIT425	Operation Research	3	C
CIT465	Network Administration	2	C
	Total Credit Units Compulsory Courses	14	

Students to take one elective courses

CIT461	Internet Architecture & Communication	3	E
	Total Credit Units Electives Courses	**3**	

2nd Semester- Compulsory Courses

Course Code	**Course Title**	**Unit(s)**	**Status**
MTH402	General Topology II	3	C
MTH412	Functional Analysis II	3	C
CIT478	Artificial Intelligence	3	C
MTH499	Project	6	C
	Total Credit Units Compulsory Courses	**15**	

Students to take one elective courses

CIT474	Introduction to Expert System	2	E
CIT432	Software Engineering II	3	E

	Total Credit Units Electives Courses	**2/3**	

BSc. MATHEMATICS WITH COMPUTER SCIENCE - **DPP**

Course Code	**Course Title**	**Unit(s)**	**Status**
BIO101	General Biology I	2	C
BIO191	General Biology Practical I	1	C
CHM101	Introductory Inorganic Chemistry	2	C
CHM103	Introductory Physical Chemistry	2	C
CHM191	Introductory Practical Chemistry I	1	C
CIT101	Computers in Society	2	C
GST101	Use of English and Communication Skills	0	C
GST105	History and Philosophy of Science	0	C
GST107	The Good Study Guide	0	C
MTH101	Elementary Mathematics I	3	C
MTH103	Elementary Mathematics III	3	C
PHY101	Elementary Mechanics, Heat and Properties of Matter	2	C
PHY191	Introductory Practical Physics I	1	C
	Total Credit Units	**19**	

2nd Semester

Course Code	**Course Title**	**Unit(s)**	**Status**
BIO102	General Biology II	2	C
BIO192	General Practical Biology II	1	C

CIT102	Software Application Skills	2	C
CHM102	Introductory Organic Chemistry	2	C
CHM192	Introductory Practical Chemistry II	1	C
GST102	Use of English and Communication Skills II	0	C
MTH 102	Elementary Mathematics II	3	C
STT102	Introductory Statistics	2	C
PHY102	Electricity, Magnetism and Modern Physics	3	C
PHY192	Introductory Physics Laboratory II	1	C
	Total Credit Units	**17**	

Note: Students that failed the "old" former

- MTH 121, MTH 131 should register for MTH 101
- MTH 133, MTH 142, should register for MTH 103
- MTH 112 , MTH 122 should register for MTH 102
- MTH 102 should register for STT 102

(i.e. Matriculation number not earlier than 2014 (NOU14…)).

200 Level 1st Semester- Compulsory Courses

Course Code	Course Title	Unit(s)	Status
GST201	Nigerian Peoples and Culture	0	C
GST203	Introduction to Philosophy and Logic	0	C
CIT237	Programming and Algorithm	3	C
MTH281	Mathematical Methods I	3	C
MTH211	Introductory Set Theory and Abstract Algebra	3	C
MTH213	Numerical Analysis I	3	C
MTH241	Introduction to Real Analysis	3	C
	Total Credit Units Compulsory Courses	**15**	

Students to take one elective courses

CIT211	Introduction to Operating Systems	3	E
CIT215	Introduction to Programming Languages	3	E
MTH210	Introduction to Complex Analysis	3	E
	Total Credit Units Electives Courses	**3**	

2nd Semester- Compulsory Courses

Course Code	**Course Title**	**Unit(s)**	**Status**
GST202	Fundamentals of Peace Studies and Conflict Resolutions	0	C
MTH212	Linear Algebra	3	C
MTH232	Elementary Differential Equations	3	C
MTH282	Mathematical Methods II	3	C
CIT208	Information Systems	2	C
CIT212	Systems Analysis and Design	3	C
CIT246	Introduction to Computer Organization	2	C
	Total Credit Units Compulsory Courses	**16**	

Students to take one elective course

CIT292	Computer Laboratory	2	E
STT211	Probability Distribution I	3	E
	Total Credit Units Electives Courses	**2/3**	

300 Level 1st Semester- Compulsory Courses

Course Code	Course Title	Unit(s)	Status
GST301	Entrepreneurial Studies	0	C
CIT333	Software Engineering I	3	C
CIT341	Data Structures	2	C
CIT351	C# Programming	2	C
MTH301	Functional Analysis I	3	C
MTH341	Real Analysis	3	C
	Total Credit Units Compulsory Courses	**13**	

Students to take two elective courses

CIT311	Computer Networks	3	E
CIT331	Theory of Computation	3	E
CIT309	Computer Architecture	3	E
STT311	Probability Distribution II	3	E
	Total Credit Units Electives Courses	3	

300Level 2nd Semester -Compulsory Courses

Course Code	Course Title	Unit(s)	Status
MTH312	Abstract Algebra II	3	C
CIT342	Formal Languages & Automata Theory	3	C
CIT363	Introduction to Internet Programming	3	C
CIT389	Industrial Training	6	C
	Total Credit Units Compulsory Courses	**15**	

Students to take one elective courses

CIT345	Introduction to Computer Design	3	E
CIT371	Computer Graphics & Animations	3	E
	Total Credit Units Electives	**3**	

400 Level 1st Semester- Compulsory Courses

Course Code	Course Title	Unit(s)	Status
MTH401	General Topology I	3	C
MTH411	Measure Theory & Integration	3	C
CIT403	Seminar on Emerging Technologies	3	C
CIT425	Operation Research	3	C
CIT465	Network Administration	3	C
	Total Credit Units Compulsory Courses	15	

Students to take one elective courses

CIT461	Internet Architecture & Communication	3	E

CIT481	Website Design & Management	3	E
	Total Credit Units Electives Courses	**3**	

2nd Semester- Compulsory Courses

Course Code	**Course Title**	**Unit(s)**	**Status**
MTH402	General Topology II	3	C
MTH412	Functional Analysis II	3	C
CIT478	Artificial Intelligence	3	C
MTH499	Project	6	C
	Total Credit Units Compulsory Courses	**15**	

Students to take one elective course

CIT474	Introduction to Expert System	3	E
CIT462	Web Server Technology	3	E
	Total Credit Units Electives Courses	**3**	

NB:

CIT389

CIT403

MTH499 are registrable but not examinable

Course Description

BIO 101 GENERAL BIOLOGY I (2 UNITS)

Characteristics of living things; cell as the basic unit of living things, cell structure, organization, cellular organelles, tissues, organs and systems. Classification of living things, general reproduction and concept of inter-relationships of organism. Heredity and evolution. Elements of ecology (introduction) and habitats.

BIO 102 GENERAL BIOLOGY II (2 UNITS)

Systematic studies of diversity of life including monera, protista, plants (Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and angiosperms) and animals (Protozoa, Platyhelminthes, Annelids, Arthropods, Fishes, Amphibians, Reptiles, Birds and Mammals) based on similarities and differences in external morphology. Taxonomic divisions of plant and animal kingdoms. Ecological adaptations of these forms.

BIO 191 GENERAL BIOLOGY PRACTICAL I (1 UNIT)

What practical work in biology involves. Laboratory organization. Handling common laboratory equipment. Microscopic handling and maintenance. Making microscopic measurements. Procuring animal materials for practicals. Killing, preserving and maintaining animal materials. Procuring plant materials. External features of plants (differences and similarities). Preparation of temporary slides. Preparation of stains and reagents. Techniques for microbial culture and grain staining. Setting up demonstration for physiological processes in plants. Setting up apparatus for demonstrating physiological processes in animals. Preparation required for dissection.

CHM 101 INTRODUCTORY TO INORGANIC CHEMISTRY (2 UNITS)

Units and measurements in chemistry, the atomic theory, quantum theory and mechanics. Electronic configuration of the elements, chemical bonding. Gaseous, liquid and solid states. Energy term, chemical kinetics, Redox reaction, acid and bases ionic equilibrium, Coordination complexes, extraction of elements, some general characteristics of organic molecules (Structures, stability, solubility, acid-base property) Isolation, purification and analysis of organic compounds;

Empirical & Structural formulae; Bonding in organic compounds (including hybridisation); Homologous series & functional groups; hydrocarbons: nomenclature and isomerism.

CHM 102 INTRODUCTORY ORGANIC CHEMISTRY (2 UNITS)

Simple reactions of hydrocarbons, alcohols, and acids. Petroleum chemistry, Oils and fats, hydrogenation of oils, polymer and biologically important molecule.

CHM103: INTRODUCTORY PHYSICAL CHEMISTRY (2 UNITS)

Mole concepts and calculations based on it, methods of expressing concentrations, Chemical Kinetics and equilibrium, and related calculations, Important application of equilibrium – pH, solubility products and solubility of ionic solids, Thermo chemistry and simple calculations based on Hess's law, Electrochemistry and working of various cells, Brief mentions of corrosion; chemical thermodynamics;

$\Delta G = \Delta H - T\Delta S$

CHM 191: INTRODUCTORY PRACTICAL CHEMISTRY I (1 UNIT)

Practical based of CHM 101 and CHM 103: Cations and anions – identification, Acid- base titrations, Redox reactions and determinations

CHM 192: INTRODUCTORY PRACTICAL CHEMISTRY II (1 UNIT)

Practical based on general chemistry CHM 101 and introductory organic chemistry I CHM 102- Determination of melting and boiling points and reaction of functional groups.

CIT 101: COMPUTERS IN SOCIETY (2 UNITS)

What is Computer, Types of Computer, History of Digital Computer, Element of a Computer : Hardware and Software. How to work with a computer. Operating System Windows Files word processing, copying a text, saving, Changes to a document and Formatting, spelling checker and introduction to Printing a document. Spread sheet, Entering and correcting data. Using Formula, Numeric Formats Creating Charts. Types of Charts Power Points and presentation. Networking, Internet and E-mail. Reading and responding to an E-mail message.

CIT 102: SOFTWARE APPLICATION SKILLS (2 UNITS)

Brief description of computer system: CPU, I/O devices; Operating systems; Computer File Management; Computer Software: overview, types, etc.; Application software: common application software; Using Microsoft Word; Using Microsoft Excel; Features of Database

Applications and Microsoft Access; Statistical Analysis Applications; Using SPSS software; Introduction to Desktop Publishing applications; Computer applications in Nursing; Computer applications in Agriculture; Managing the computer system with the Control Panel.

GST 101 USE OF ENGLISH AND COMMUNICATION SKILLS I (2 UNITS)

Listening- enabling skills, listening and comprehending, note taking and information retrieval. Including data, figures, diagrams and charts, Listening for main idea, interpretation and critical evaluation. Effective reading, skimming and scanning. Reading and comprehension at various speed levels. Vocabulary development in various academic context. Reading diverse texts in narratives and expository. Reading and comprehension passges with tables, scientific texts. Reading for interpretation and critical evaluation.

GST 102 USE OF ENGLISH AND COMMUNICATION SKILLS II (2 UNITS)

Writing paragraphs: Topic sentence and coherence. Development of paragraphs: illustration, description, cause and effect including definitions. Formal letters: essential parts and stylistic forms; complains and requests; jobs, ordering goods, letters to government and other organisations. Writing reports; reporting event, experiments. Writing summaries; techniques of summarising letters and sounds in English, vowels and consonants. Interviews, seminar presentation, public speech making, articles, concord and sentences including tenses. Gerund, participles, active, passive and the infinitive. Modal auxiliaries.

GST 105 HISTORY AND PHILOSOPHY OF SCIENCE (2 UNITS)

General description of the nature of science and basic scientific methods and theories; history of western science and science in ancient times, middle ages and the rise of modern science; an overview of African science; man and his environment and natural resources; nature, scope and technological development and inventions; great scientist of Nigerian origin.

GST 107 THE GOOD STUDY GUIDE (2 UNITS)

Getting started: How to use the book, why read about skills, getting yourself organised ; what is studying all about, reading and note taking; Introduction, reactions to reading, your reading strategy, memory, taking notes, conclusion. Other ways of studying: Introduction, learning in groups, talks and lectures, learning from TV and radio broadcasts, other study media. Working with numbers; Getting to know numbers, describing the world, describing with the tables, describing with diagrams and graphs; What is good writing? The Importance of writing, what does an essay look like, what is a good essay? Conclusion. How to write essays: Introduction, the

craft of writing, the advantages of treating essay writing as a craft, making your essay flow, making a convincing case, the experience of writing. Preparing for examination.

MTH 101 ELEMENTARY MATHEMATIC I: (3 Units)

(ALGEBRA AND TRIGONOMETRY)

Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand Diagram. Re Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formalae.

MTH 102 ELEMENTARY MATHEMATICS III: (3 Units) PRE-REQUISITE - MTH 101

(VECTORS, GEOMETRY AND DYNAMICS)

Geometric representation of vectors in 1-3 dimensions, components, direction cosines. Addition and Scalar multiplication of vectors and linear independence. The Scalar and vector products of two vectors. Differentiation and integration of vectors with respect to a scalar variable. Two-dimensional co-ordinate geometry. Straight lines, circles, parabola, ellipse, hyperbola. Tangents, normals. Elementary Mathematics IV. Impact of two smooth sphere, and of a sphere on a smooth sphere.

STT102: INTRODUCTORY STATISTICS

Measures of Central Tendency and dispersion, (grouped and ungrouped); mean: - arithmetic and geometric, harmonic, median, mode quartiles, deciles, modes, relative and absolute dispersion, sample space and events as sets. Finite probability space properties of probability. Statistical independence and conditional probability. Tree diagram. Baye’s theorem. Discrete and continuous random variables. Expectation, independent Bernoulli trials. Binomial, Poisson and Normal distributions. Normal approximation to binomial and Poisson distribution, Hyper geometric.

PHY 101: Elementary Mechanics, Heat and Properties of Matter (2 UNITS)

Space and Time: Physical quantities: Units and dimensions of physical quantities; Kinematics: Uniform velocity motion, uniformly accelerated motion; Dynamics: Newton's laws of motion; Impulse and Linear Momentum, Linear Collision, Newton's universal law of gravitation; Work,

energy and power; Conservation laws; Concept of mechanical equilibrium; Centre of mass and centre of gravity; Moment of a force; Rotational kinematics and dynamics: Torque; Moment of Inertia; angular momentum; Total mechanical energy. Simple harmonic motion

Heat and temperature, work and heat, Quantity of heat: heat capacities, latent heat; Thermal expansion of solids, liquids and gases; Gas laws, heat transfer; Laws of thermodynamics: Isothermal and Adiabatic changes, Carnot cycle; Application kinetic theory of gases; van der Waals gas.

Classification of matter into (solids, liquids and gases, forces between atoms and molecules, molecular theory of matter, Elasticity, plasticity, Hook's Law, Young's Shear and bulk Moduli) Crystalline and non-crystalline materials, Hydrostatics: pressure, buoyancy, Archimedes' principle; Hydro-dynamics-streamlines, Bernouli and Continuity equations, turbulence, Reynold's number, Viscosity, laminar flow, Poiseuille's equation; Surface tension, adhesion, cohesion, capillary, drops and bubbles.

PHY 191: INTRODUCTORY PHYSICS LABORRATORY I (1 UNITS)

Graphs, Measurement, Error Analysis, Determination of Acceleration due to Gravity by Means of Simple Pendulum, Determination of force constant of a spiral spring, Determination of effective mass of a spiral spring and the constant, Determination of surface tension of water, Determination of specific latent heat of fusion of ice, Determination of the co-efficient of limiting static friction between two surfaces, Determination of the co-efficient of static friction on two surfaces using an inclined plane, Determination of Relative Density of kerosene using the specific Gravity Bottle,

PHY102: ELECTRICITY, MAGNETISM AND MODERN PHYSICS (2 UNITS)

Electrostatics: Coulomb's law, Gauss's law, potential and capacitance, dielectrics, production and measurement of static electricity. Current: Ohm's law, resistance and resistivity, heating. Galvanometers, Voltmeters and Ammeters; D.C. circuits: sources of emf and currents, Kirchhoff's laws; Electrochemistry; The Earth's magnetic field; Magnetic fields and induction, Faraday's and Lenz's laws; Force on a current-carrying conductor. Biot-Savart law. Flemming's right and left-hand rules, motors and generators. A.C. Theory. Atomic structure; Production and properties of X-rays; Radioactivity; Photoelectric emission. FMT 204: Introduction to Mathematical Economics (3UNITS)

Logarithms, Exponential and Growth Mathematics. Production functions, Differential and Total derivatives, Matrix Algebra, Input-Output Analysis. Comparative Statistics. Linear Programming, Dual Programming. Games Theory.

CIT 208: INFORMATION SYSTEMS

Introduction & Basic SQL Project Introduction. Advanced SQL. Conceptual Modelling and Schema Design. Database Programming, JDBC, Regular Expressions. Functional Dependencies E2: Functional Dependency & Relational Algebra. Relational Algebra. Introduction to XML. XML and XQuery. Web Services. Transactions. Recovery. Database Heterogeneity.

CIT 211: INTRODUCTION TO OPERATING SYSTEM

Definition of an operating system; Types of operating systems; and real time (single-user/multi-user), timesharing; Examples of operating systems; DOS, CP/M, UNIT/ZENITH,/LINUX, MS/9798/2000, etc. Components of an operating system; Supervisor, memory manager, I/O handlers, file system, etc. Operating system interface with the hardware; interrupts, i/o channel, multiplexer, registers, status words. Operating system interface with other systems softwares; linkers, translators, libraries, etc. storage organization and protection.

CIT 212: SYSTEMS ANALYSIS & DESIGN

General systems concepts: Systems project team organisation; Overview of systems development process; Project identification and selection; system requirements analysis and feasibility study; fact finding techniques; Systems design; Analysis techniques and tools e.g. Jackson System Development (JSD) techniques etc. Data flow diagrams, HIPO charts. Business system design; procurement, site preparation, system installation, system testing, system conversions; system project, report writing, and presentation; system documentation; post installation evaluation; compilation of a real-life system analysis team project to provide experience in applying the principles and techniques presented above

CIT 215: INTRODUCTION TO PROGRAMMING LANGUAGES

FORTRAN programming language; Comparison of various versions of the language. Programming exercises using FORTRAN with emphasis on scientific application problems. Elements of Pascal language. Exercises in Pascal Program structures and programming concepts; Structured design principles; abstraction, modularity, stepwise refinement, structured design techniques teaching of a structured programming language, e.g. PASCA/JAVA, C^{++}.

CIT 237: Programming and Algorithms

The programme development process, programme design, coding, and testing principles of good programming styles; Programme verification techniques; Programme documentations and maintenance; Programme design tools, e.g. flowcharts, pseudocodes, etc. Illustration of the various concepts with practical programming problems of manageable complexity e.g. Knight's tour or 8-queens, life game problems, etc. Algorithms and data structures; Divide-and-conquer

algorithms; Stacks, queues, trees. A treatment of popular sorting and searching algorithms; performance analysis of algorithms. Worst-, best-and average-case performance of the algorithms. Recursion, Hill-climbing techniques.

CIT 292: Computer Laboratory 1

Basic logic Operations. Combinational logic, Karnaugh maps, Simple latch and clocked flip flop, J-k flip-flops, Binary addition, Synchronous counters, up and down counters.

CIT 246: INTRODUCTION TO COMPUTER ORGANIZATION

Number systems; Number representation; Computer arithmetic; Basic instruction cycle; Data types; Instruction types; Addressing modes; Assemblers, linkers, loader; Subroutines, stacks; I/O, traps, interrupts; Floating-point instructions; Instruction set design; Virtual machines, compilation/interpretation.

MTH 210 : INTRODUCTION TO COMPLEX ANALYSIS

Complex number, the topology of complex plane. Limits and continuity of function of complex variables, properties and example of analytic functions, branch-points, Cauchy-Riemann equations. Harmonic function.

MTH 211: INTRODUCTION TO SET THEORY AND ABSTRACT ALGEBRA

Set: Binary operations, mapping, equivalence relations integers: Fundamental theorem of arithmetic, congruence equations, Euler's function (n) Group Theory: Definition and examples of groups. Subgroups, coset decomposition, Lagrange's theorem. Cyclic groups. Homonorphisms, isomorphism. Odd and even permutations, Cayley's theorem. Rings: Definition and examples of rings. Commutative rings. Integral domain. Order, well-ordering principles. Mathematical induction.

MTH 213: NUMERICAL ANALYSIS I

Interpolation: Lagrange's and Hermite interpolation formulae, divided differences and difference schemes. Interpolation formulas by use of divided differences. Approximation: Least-square polynomial approximation, chebychev polynomials continued fraction and rational fraction orthogonal polynomials. Numerical Integration: Newton's-cotes formulae, Gaussian Quadrature.Solution of Equations: Graeffe's method. Bernoulli's method, Newton's method, Bairstow's method (iterative method) Matrices and Related Topics: Definitions, Eigenvalue and Eigenvectors, Algebraic Eigenvalue problems-power method, Jacobi method.

Systems of linear Equations: Gauss elimination, Gauss-Jordan method. Jacobi iterative method, Gauss-field iterative method.

MTH 241: INTRODUCTION TO REAL ANALYSIS

Set: Cartesian products, functions and mappings direct and inverse images. Countable sets. Limits: Elementary properties of limits. Upper and lower bounds, supremum, infimum, convergence of sequences. Limit of monotone functions and sequences. Cauchy's convergence principles. Continuity: Real-Valued functions of a real variable; Monotone functions, periodic functions, bounded functions. Continuity of functions using neighbourhood. Elementary properties of continuous functions. Uniform continuity. Series: convergence of series, tests for convergence, absolute convergence, power series, uniform convergence.

MTH 212 LINEAR ALGEBRA II

Vector spaces. Liner independence. Basis, change of basis and dimension. Linear equations and matrices. Linear maps. The diagonal, permutation, triangular matrices. Elementary matrix. The inverse of a matrix. Rank and nullity. Determinants. Adjoint, cofactors, inverse matric. Determinantial rank. Crammer's rule. Canonical forms, similar matrics, Eigen values and vectors, quadratic forms.

MTH 232 ELEMENTARY DIFFERENTIAL EQUATION

Introduction, equation of first order and first degree, separable equations, homogeneous equations, exact equations, linear equations, Bernoulli's and Riccati equations. Applications to mechanics and electricity. Orthogonal and oblique trajectories. Second order equations with constant coefficients.

MTH 251 MECHANICS

Static: System of live vectors. Coyoles and wrenches. Principles of virtual work. Stability of equilibrium. Dynamics of systems of particles: Elastic strings. Hooks law. Motion in resisting media. Changing mass. Motion along a curve. Frenets formulae.

MTH 281: MATHEMATICAL METHODS I

Sequences and Series: Limits, continuity, Differentiability, implicit functions, sequences. Series, test for convergence sequences and series of functions. Calculus: partial differentiation, total derivatives, implicitly functions, change of variables. Taylor's theorem and maxima and minima functions, of two variables. Langrangian multiplier. Numerical Methods: Introduction to iterative methods, Newton's method applied to finding roots. Trapezium and Simpson's rules of integration.

MTH 282 MATHEMATICAL METHODS II (3 UNITS)

Elementary Vector Algebra, Vector and Tripplre vector Products (more application 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 scaler products; senent frenent formulae; differential definition of gradients, divergent and simple multiplication)curvilinear coordinates. Complex Numbers: The algebra and geometry of complex numbers; de'moivre's theorem. Elementary transcendental functions. The n^{th} root of unity and of a general complex number.

STT 211: PROBABILITY DISTRIBUTION I (3 UNITS)

Discrete sample spaces: Algebra and probability of events, combinatorial analysis. Sampling with and without replacement. Conditional probability, Bayes theorem and stochastic independence. Discrete distributions: Binomial, Poisson, negative binomial-hyper geometric and multinomial. Normal approximation to binomial and Poisson, Poisson approximation to binomial. Random variables and expectations: mean, variance, covariance. Probability generating function and moment generating function. Chebychev's inequality. Continuous joint distributions: marjind as conditional density. Expectations**:** movement**,** movement generating functions. Uniform, normal, beta Cauchy and hop-normal distributions.

GST201 NIGERIAN PEOPLES AND CULTURE (2 UNITS)

Nigerian history, culture and arts in pre-colonial times; Nigerians' perception of their world; culture areas of Nigeria and their characteristics; evolution of Nigeria as a political unit; indigene/settler phenomenon; concepts of trade; economic self- reliance; social justice; individual and national development; norms and values; negative attitudes and conducts (cultism and related vices); re-orientation of moral and national values; moral obligations of citizens; environmental problems.

GST 202: FUNDAMENTALS OF PEACE STUDIES & CONFLICT RESOLUTIONS (2 UNITS)

Basic Understanding of Conflict; Definitions, Causes and Types of Conflict, Conflict Theories, Phases in Conflict, Conflict Analysis & Transformation. Dynamics of Conflict; Relationship between Perception and Conflict, Language Barriers in Conflict and Resolution, Early Warning and Early Response Mechanism, Arms Control and Demilitarization, Peace and Education. Trends in Global Issues: International, Continental and Regional Organizations in the Pursuance of World Peace, Peaceful Methods of Conflict Resolution, Coercive Means of Conflict Resolution, Gender Issues and Humanitarian Intervention.

GST 203: PHILOSOPHY AND LOGIC (2 C)

Fundamentals of logic and critical thinking; types of discourse; nature of arguments; validity and soundness; techniques for evaluating arguments; distinction between inductive and deductive

inferences; etc. Illustrations from familiar texts, including literature materials, novels, law reports and newspaper publications

GST 301: ENTREPRENEURSHIP STUDIES (2 UNITS)

Definition of Entrepreneurship, Relationship Between Entrepreneurship and Small Business Management, Factors of Entrepreneurship; Dealing with External Factors of Entrepreneurship; Factors of Production; Profit and Other Objectives of an Entrepreneur, the Business Environment, Understanding Viability Study; Needs and Characteristics of Consumers; Mission and Enterprise Objectives; Export Market Shares; Target Market; Income Determination; Break-even Point, Size of the Business, Location Factors; Financial Requirements Forms of Ownership; Business Plan. Risk Analysis; Legal Requirements; Staffing, Purchasing; Production; Management.

MTH 301 FUNCTIONAL ANALYSIS I

Metric Spaces – Definitions and examples. Open Sphere of (balls) closed sets, interior, exterior, frontier, limit points and closure of a set. Dense subsets and separable space. Convergence in metric space, homeomorphism, continuity and compactness.

MTH 381: MATHEMATICAL METHODS III

Functions of several variables: Jacobian, functional dependence and independence. Multiple integrals, line integrals. Improper integrals. Vector Field theory: Relations between vector field functions. Integral theorems. Gauss's, Stoke's and Green's theorems. Elementary tensor calculus. Functions of a complex variable: The Cauchy-Riemann equations. Integration of complex plane. Cauchy's theorem Cauchy's inequality. The residue theorem and the evaluation of integrals. Integral Transforms: Fourier and Laplace transforms. Convolution properties and their applications.

STT301: STATISTICAL INFERENCE

Sampling and sampling distributions. Point and interval estimation. Principles of hypothesis testing. Testing of hypothesis concerning population means, proportions and variances for large and small samples, large and small sample cases. Goodness-of-fit-test. Analysis of variance.

STT 311: PROBABILITY DISTRIBUTION II

Probability spaces measures and distribution. Distribution of random variable spaces. Product probabilities. Independence and expectation of random variables. Convergence of random variables. Week convergence almost everywhere, laws of large numbers. Characteristic function and inversion formula.

STT 313: STOCHASTIC PROCESSES I

Random at walk and run problems, fluctuations in coin tossing, mark or chains: classification of states; ergodic properties, applications. Generating functions convolutions; first passage times; partial fractions expansions, bivariate generating functions. Recurrent events.

STT 316 MULTIVARIATE ANALYSIS AND APPLICATION

Vector random variables. Expectations of random vectors and matrices. Multivariate normal distribution and distribution of quadratic forms. Application to linear models: Tests of general linear hypothesis and estimation. Least square theory: Guass-Markoff and general linear hypothesis with applications to regression and experimental design models. Estimation: partial and multiple correction coefficients, mean vector and co-variance matrix. Hatelting's T^2 and Wishart distribution: multivariate ANOVA.

STT 321: SAMPLE SURVEY DESIGN

The role of sampling. Principle steps in sample surveys. Sampling with and without replacement. Theory of estimation of mean, variance, proportion and regression estimates in simple random, stratified, systematic, multistage and cluster sampling. Determination of sample sizes and optimum allocation.

CIT 333: SOFTWARE ENGINEERING I

Top-DOWN design, modularity, technical and managerial problem of software development design representations; e.g. pseudo code HIPO diagrams CASE tools and Programming Environments.

CIT 309: COMPUTER ARCHITECTURE

Introduction, basic computer organization; Instruction formats, instruction sets and their design; ALU design: Adders, subtracters, logic operations; Boolean Algebra; Karnaugh Maps; Datapath design; Control design: Hardwired control, microprogrammed control; More on arithmetic: Multiplication, division, floating point arithmetic; RISC machines; Pipelining; Memory systems and error detection and error correction coding; Caches; Memory; I/O and Storage; Multiple Issue; Dynamic Scheduling; Data-Level Parallelism and Vectors; Shared-Memory; Multiprocessors; Multithreading

CIT 311: COMPUTER NETWORKS

Basic models of communication; data communication and networks; protocols and their basic architecture; idea for standardization; transfer of data; tools and mediums for transfer; data coding; data communication interfaces; control of data connections; multiplexing; local area networks;

technology, architecture and systems; wide area networks; types of commutation; integrated digital services; internetwork communication; network level; basics of OSI and Internet architecture and referent models; Internet protocols; traffic control; Types of network protocols; transport protocols; application level; system aspects network security; distributed applications; basic network services; network management; OSI and Internet models for management; definition of system servers: from addresses and names to services.

CIT 331: THEORY OF COMPUTATION

Finite Automata, Turing machine, Recursively enumerable sets, Halting Problem. Computability and Decidability. Predicate Logic, Validity Problem, Deduction, Herband's procedures, Robinson's resolution rule. Program Verification; Formal Semantics.

CIT 341: DATA STRUCTURES

Basic data structure including lists and trees, constructs for specifying and manipulating data types. List structures, Binary, AVL and other trees, traversal algorithm, graphs, rings, recursive programming, storage managements; stacks, queues, language features affecting static and dynamic data structures, fixed and variable sized blocks, best-fit, first-fit, etc. garbage collection, fragmentation, buddy system, block compaction and relocation hash tables, programming exercises involving the implementation and use of data structures.

CIT 351: C# PROGRAMMING

Introduction to programming: Algorithms and flowcharts; Data types in C#; Operators and expressions in C#; Decision Structures in C#; control structures; Pointers and Arrays; Functions; File and Structs, Union and Bit-fields;

CIT 363: INTRODUCTION TO INTERNET PROGRAMMING

Introduction to current programming models in generating and supporting rich real-world web based applications. Internet architecture and organization. Internet services, electronic mail, data transfer, dial-up, connection protocols. Connection to Internet: modem connection, dial-up servers. Modern protocols for multimedia communication: Common Gateway Interface (CGI), multimedia messaging, protocols for multimedia communication – hypertext. HTML programming language: HTML tags and concepts such as tables, frames, forms and cascading style sheets; hypertext design. Web services and servers, examples and design of web pages, search engines and indexing. Elements of programming language: JavaScript, dynamic HTML pages. Development and the future communication using Internet. New technologies.

CIT 342: FORMAL LANGUAGES AND AUTOMATA THEORY

Introduction to language structures; languages and their representations; Grammars; formal notations, types, Chomsky's language hierarchy; sentence generation and recognition; derivations; Ambiguity and syntax and finite state automata; context-free grammars; simplification of context-free grammars; Chomsky, Greibach Normal Forms Push-Down automata, LR(K) grammars, Recursive languages; semantics. Lab. exercises.

CIT 345: INTRODUCTION TO COMPUTER DESIGN

Introduction to numbers and codes. Combinational logic design and applications: adders, decoders, multiplexers, etc. Sequential logic design and applications: registers, flip-flops, etc., and general finite state machines. Memory devices: read-only memory (ROM), random access memory (RAM). Introduction to microprocessors: arithmetic logic unit (ALU), basic CPU architecture, addressing modes and program execution. Assembly language programming: programs for simple tasks; branching, loops, and subroutines.

CIT 321: COMPUTER OPERATIONAL SYSTEMS I

Historical developments of operating systems and computer hardware, Operating systems types; necessary hardware requirement and operating characteristics, concurrent programming, batch versus time-sharing, multi-processing systems; the supervisor, resources allocation and deallocation, interrupts and interrupts handling, device handlers, memory organization virtual memory and virtual machine, remote job entry, pipeline processing, command languages more about DOS/VS/JCL in respect of maintenance of libraries and job organization.

CIT 371: COMPUTER GRAPHIC & ANIMATIONS

Raster Graphics: Introductions, Display technologies, Java Overview, Pixels, a Raster Object, Images, Sprites, Raster-ops, and Bitblts, Color (models, and frame-buffer structure), Line drawing (DDAs, Bresenham's), Curve drawing (circle, conics, Area filling), Scan Conversion of Triangles and Interpolation, 2-D geometric transformations and dithering, User Interface design, Interaction Models. **3D Graphics**: Transformations, Homogeneous Coordinates, Viewing and Projection, Modeling primitives and hierarchies, 3D Clipping, Visible-surface determination, Illumination and Shading, Ray Tracing, Textures and Animation, Radiosity and Global Illumination.

CIT 389: INDUSTRIAL TRAINING (3 UNITS)

6 months of Industrial Training Students' experience will be documented and presented in a logbook. The training experience will also be presented in a report this together with the logbook, dully signed and graded by the students' supervisor will be submitted to the CIT unit, SST NOUN for final vetting and recording of the grade.

MTH 341 REAL ANALYSIS

Integration: The integral as the area of the ordinate set of a function. Definition of the Riemann integral of bounded functions. Conditions for integrality. Properties of the integral. Relations between integrals and derivatives. Approximation to integrals by sum.

The Riemann Integral: Riemann-Sieltejes integral. Properties, functions of bounded variation and extension to the notion of integration. Sequences and Series of Functions: Convergence of sequences and series of functions. Uniform convergence. Continuity of sum of a uniform convergent series of continuous functions. Terms by term integration and differentiation of a series of continuous functions. Applications to power spaces metric spaces.

MTH 382 MATHEMATICAL METHODS IV

Ordinary Differential Equations: The concept of existence and uniqueness of solutions. Operational methods of solution of linear equations. Sturm-Lionvelle theory, Green's functions, series solution. Special functions and some of thir elementary properties; Gamma and Beta functions. Partial Differential Equations: Solutions of boundary and eigenvalue problems of partial differential equations by various methods which include: Separation of variables, transform techniques. Sturn-Lionville theory; Green's functions; method of characteristics.

MTH 312 ABSTRACT ALGEBRA II

Normal subgroups and quotient groups. The isomorphism theorem. Symmetric groups, automorphism, conjugate classes, Normalisers. The sylow theorems. Normal and composition series. The Jordan-Holder theorem. Direct product. Solvable group. Isomorphism theorems for rings. Ideals and quotient rings. Commutative ring, maximal ideals. Euclidean rings, principal ideal domain and unique factorization domain.

MTH 401 GENERAL TOPOLOGY 1

Point Set Topology: The space R" Euclidean metric. Metrics, open spheres, metric topologies, metric spaces, properties of metric topologies Equivalent metric. Heine-Borel theorem. B olano-wirestree theorem. Properties of separable, complete, compact, locally-compact and connected spaces. Cantor's set. Continuity and uniform continuity of mappings on metric space Topological spaces: Definitions, examples, accumulation points, closes set, closure, interior, exterior and boundary of a set Neighbourhoods and neighbourhood systems. Coarser and finer topologies, subspaces and relative topologies. Base for a topology sub bases.

MTH 402 GENERAL TOPOLOGY II

Separation axioms: T-spaces, Huasdorff spaces, Regular spaces, Normal spaces, Urgsohn's lemma. Category and seperability: Dense sets, nowhere dense sets. Sets of the first and second categories. Perfectly separable spaces, separable spaces. The axiom of countability. Compactness:

Covers, compact sets, subset of compact spaces. Sequentially, countably and locally sets. Compactification. Product spaces: product topology. Base for a finite product topology. Tychonoff product theorem. Connectedness: separated sets, connected sets, connected spaces. Connectedness of the real line. Components. Locally-connected spaces. Homotopic paths. Homotopy relations. Simple connected spaces.

MTH 411 MEASURE THEORIES AND INTEGRATION

Measure Theory: Measure of open, closed sets. Outer and inner measure. Measurable sets. Properties of measure. Non-measurable sets. Measurable in the scene of Borel. Measurable space. Measurable functions. Simple function Algebra. The Lebesgue integral: Lebesgue measure. Integral of non-negative function. Integral as measure of ordinate set, as a limit of approximate sums, Integral of an unbounded function, Integral over an infinite range. Simple properties of the integral Sequences of integral (Positive functions; functions with positive and negative values) Lesbesgue monotone convergence theorem. Fatou's Lemma, Dominated convergence. Bepo's Lemma-Bounded Convergence. Sets of measure zero, Integration by parts. Fubini theorem and applications to multiple integrals.

STT 411 PROBABILITY THEORY

Probability space measures and distribution. Distribution of random variables as measurable functions. Product spaces; product of measurable space, product probabilities. Independences and expectation of random variables. Convergence of random variables; weak convergence almost every where, convergence in path mean. Central limit theorem, laws of large numbers. Characteristic function and Inversion formula.

MTH 412 FUNCTIONAL ANALYSIS II

Normal Linear Space: Definition and examples. Convex sets. Norms. Holders Minkowski's inequalities. Riese-Fisher theorem. Linear Operations on finite dimensional spaces. Linear functionals spaces Banach spaces, examples. Quotient spaces. Linear product spaces. Topological linear spaces. Hilbert space, examples. Linear operators in Hilbert spaces. Adjoint operators. Hermitian operators. Orthogonality; orthogonal complement projections in Hilbert spaces.

STT 411 PROBABILITY THEORY

Probability space measures and distribution. Distribution of random variables as measurable functions. Product spaces; product of measurable space, product probabilities. Independences and expectation of random variables. Convergence of random variables; weak convergence almost

every where, convergence in path mean. Central limit theorem, laws of large numbers. Characteristic function and Inversion formula.

CIT 411: MICROCOMPUTERS AND MICROPROCESSORS

Review of basic concepts in digital electronic; Microprocessors; functions; operations and architecture; comparison of current microprocessors, multi-chip and single chip; i/o organization, assembler language; comparison of instruction sets; address modes, stack operation; subroutines I/O data transfer; bus control; daisy chaining, handshaking etc; interrupt structures programmed transfer, DMA microcomputer systems; types of microprocessors; uses of microprocessors, microcomputer design for specific applications; microcomputer networking interfacing microcomputer real-time control; laboratory exercise using an assembly language.

CIT 425: OPERATIONS RESEARCH

The nature of operation research; Linear programming, simplex method, Transportation problem, allocation problems; Quadratic and Goal programming; Inventory control; Network Analysis; Replacement Analysis and Simulation; maintenance and reliability problems. Dynamic programming; sequencing and co-ordination.

CIT 445: PRINCIPLE AND TECHNIQUES OF COMPILERS

Recapitulation of formal grammars; source code and target code structure of typical compiler, comparative compiling techniques. Lexical analysis syntax analysis; simple precedence; operator precedence, LR(K) parsers; semantics, Run time storage allocation; code generation and code optimization. Compiler-compilers. Pragmatics of Compiler writing; Translator writing; Error recovery and Optimization problems; Laboratpry exercises leading to the productions of major parts of a compiler for an actual programming language.

CIT 461: INTERNET ARCHITECTURE & COMMUNICATIONS

History of the internet protocols (IP, FTP, HTTP, TCP) Network topologies Renters, Bridges Gate ways, Backbones. World wide web (www) TTP Site and examples Internet Browsers (Internet explorer, Netscape) Role of ISP's Internet Connectivity Requirements. E-mail, E-Business. Websites design and Hosting Engineers.

CIT 462: WEB SERVER TECHNOLOGY

Review of XHTML (Extensible Hypertext Markup Language) and CSS (Cascading Style Sheets). Introduction to client-side scripting languages such as JavaScript in Web application development. Use a client-side programming language such as JavaScript to develop interactive Web content including forms, style sheets, data validation, and animation. Introduction to Web server technology and Web-based applications. Survey of server-side programming languages such as

CGI-Perl and PHP. Introduction to XML (Extensible Markup Language). An overview of database operations. Introduction to the deployment of applications to a Web server. Complete an integrated Web application that integrates a database along with client-side and server-side applications.

CIT 463: MULTIMEDIA TECHNOLOGY

Introduction: What is multimedia, Multimedia systems, Quality of service, Synchronization & orchestration, Standards, Convergence, Value chain. Hardware: Multimedia computers, Video and graphics, Audio, Telephone, video conference, and networks, CD and DVD, USB and FireWire, Processors, Video for Windows, DirectX, and ActiveMovie. Software: Browser based software architecture, Distributed software, Servers, Network, Terminals. Audio and Video: Digital audio; Psycho acoustics, Digital presentation of sound, Digital images, JPEG, Video signal, Camera sensors, Colors, Color television, Equipment, Compression systems, Basics of video compression, Methods, Algorithms. Interchange Formats: Application areas, Requirements, Track and object model, Real-time transfer, Different transfer formats, Comparison. Authoring Tools: Production process, Tools, Barriers, Development areas. Communications: QoS, ATM, QoS implementations, Integrated Services, Differentiated Services. Multicast: Group control, Routing, Real-time transfer and control protocols, Resource reservation, Session control, MBone. Video Conference: Standards, Products, Internet telephony, CTI (Computer Telephony Integration). Access Networks: Cable television, Digital subscriber lines, UMTS, Digital television.

CIT 465: NETWORK ADMINISTRATION

Introduction to Network Administration: scope, goals, philosophy & standards. IT System Components and Network Structures, technology and protocols. System Administration: host computer and user management. Network Administration methods and Standards. Managing devices using SNMP and RMON. Management issues: planning, implementation, fault diagnosis and recovery. Network Simulation as a management tool. Network Documentation. Network Security and Administration.

CIT 469: PROTOCOLS DESIGN AND PROGRAMMING

Introduction. Stages in Protocols design: Problem definition, requirements analysis, protocol design and implementation in software. Protocol design tools. Overhead: bandwidth, CPU, etc. Protocol life cycle. Preparing for future versions of the protocol: version numbers, reserved bit fields, forwards and backwards compatibility. Parameters setting. Desirable protocol features: autoconfiguration, robustness (simple, self-stabilization and Byzantine robustness. Documentation and standardization. Planning an upgrade path for future versions. Mobility. Ubiquitous computing. Comprehensive security: Nano-computing, bio-computing.

CIT 474: INTRODUCTION TO EXPERT SYSTEMS

Study of different classes of expert systems, e.g. Rule Based: MYCIN or PROSPECTOR, Blackboard; HEARSAY or CRYSLIS, Expert System shells e.g. Rule-Based: e.g. P-MYCIN, EXPERT. S.I. Frame Based e.g. KEE, KL-ONE Merit and Demerits of natural language interface for expert systems. Extensive independent study of recent development in the field and the submission of a group proposal for the application of Expert System in different areas.

CIT 478: ARTIFICIAL INTELLIGENCE

Basic AI issues, attention Search, Control Game trees, knowledge representation, Application of AI techniques in natural language, scene analysis, expert systems, KBCS robot planning. Lab. Exercise in I lang. e.g. LISP/Prolog.

CIT 481: WEBSITE DESIGN

What is HTML; Basic Tags of HTML; HTML Tag TITLE Tag Body Tag Formatting of Text, Headers, Formatting Tags, Pre-Tag FONT TAG Special Characters Working with Images META Tag; Links: Anchor Tag, Lists; unordered lists ordered lists, definition lists, tables : TABLE, TR and TD Tags Cell spacing and cell padding colspan and Rowspan Frames: Frameset frame Tag, NOFRAMES Tag Forms: FORM and INPUT Tag,; Text Box Radio Button, checkbox. Select tag and pull down. Lists hidden submit and Reset. Some special Tags: COLGROUP, THREAD, TBODY, TFOOT, blank self, parent top, IFRAME LABEL TEXTAREA. INTRODUCTION TO Java Script: Java script variables and data types. Statement and operators, control structures object based programming message box in Javascript, Javascript with HTML forms

MTH 499: RESEARCH PROJECTS

Individual or Group projects of approved topics related to the current research interests in the department.

DEPARTMENT OF PURE AND APPLIED SCIENCES

LIST OF ALL STAFF AT THE DEPARTMENT OF PURE & APPLIED SCIENCES

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B.SC. BIOLOGY PROGRAMME

Programme Code: 5213

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PROGRAMME AND DEGREE AWARD REQUIREMENTS:

4.0 Introduction:

Biology Unit is one of the pioneer units in the School of Science and Technology that was established as a servicing unit at the inception of the University in 2004. The unit continued in its servicing capacity until the 2011/2012 academic session when the full B.Sc. (Biology) progamme took off.

4.1 Programme Duration: 4 years, 3 years for direct entry students

4.2.1 Prerequisite Course: The entry requirements into 100 level of the programme shall be at least credit level passes in five subjects including English Language, Mathematics, to form the core course with credit in three other relevant science courses Biology, Chemistry, Technical drawing Agricultural Science and Geography at the Senior Secondary School Certificate or its equivalent and at least a pass in Physics. For the B.Sc. Programme in Biological Sciences, candidates must have credit level passes in Biology, Chemistry and at least a pass in Physics.

For Direct Entry (DE) candidates with two A level passes (graded A-E) at the Advanced Level or its equivalent in one or more relevant subjects (Biology, Botany, Chemistry, Geography, Mathematics and Physics) may undertake the three – year degree programme into 200-level.

Also lower level courses that have relevance to higher ones must be offered and passed first.

4.2.2 Registration procedure: Students to register through their portals.

4.2.3. Opening and Closing of the Course Registration portal: Specified by the University Calendar.

4.3 Course re-registration: No course re-registration, only exam re-registration. Please, see ICT/MIS for strepwise process

4.4 Add and/or Drop courses: Download add and delet form from the student's portal; print, fill and procress accordingly through centre Director to ICT.

4.5 Eligibility for Graduation: To graduate, a student shall have undergone at least 6-8 semesters of study depending on entry point, including field practical training. Course work load must meet the graduation requirements of the University based on minimum academic standards. However, in doing so, the student must earn a minimum of 120 credit units for the four year programme and 90 credit units for the three years (Direct entry) programme. The submission of an undergraduate project thesis based on a supervised research is a graduation requirement which cannot be compromised

4.6 Research Projects: At the commencement of 400 Level, students are expected to submit their project topics for approval

4.7 Grading, Moderation and Mode of Submission of Projects:

4.7.1 Grading of research projects: Students projects are graded by the assigned supervisors, moderated at the Departments.

4.7.2 Mode of Submission of Projects: Projects and score sheets (hard and soft copies are submitted to the Faculty through the Study Centre.

4.10 Degree Award Requirements: The learner is required to pass all compulsory courses and complete a minimum of 120 and 90 credits for Direct entry students to qualify for an award of the B.Sc. Biology degree

4.10.1 Compulsory and Elective Courses: Compulsory courses: These are the core courses that must be offered by students and passed at a grade not below E

Elective Courses: These are optional courses which may be offered based on the interest of the student or for the purpose of fulfilling the minimum requirement for the award of the degree.

4.10.2 Minimum course credits for graduation: To graduate, a student shall have undergone at least 6-8 semesters of study depending on entry point, including field practical training. Course work load must meet the graduation requirements of the University based on minimum academic standards. However, in doing so, the student must earn a minimum of 120 credit units for the four year programme and 90 credit units for the three years (Direct entry) programme. The submission of an undergraduate project thesis based on a supervised research is a graduation requirement which cannot be compromised.

3. 4.10.3 General Studies Courses (GST): University compulsory courses must be offered and passed before graduation

Course Outline Structure:

BSc. (Hons) Degree in Biology

Year I

1st Semester

Course Code	Title	Units	Status	
BIO 101	General Biology 1	2	C	
BIO 191	General Biology Practical 1	1	C	
CHM 101	Introductory Inorganic chemistry	2	C	
CHM 191	Introductory Chemistry Practical I	1	C	
CIT 101	Computers in Society	2	C	
GST 101	Use of English and Communication Skills	0	C	
GST 107	The Good Study Guide	0	C	
MTH 101	Elementary Mathematics I	3	C	
PHY 101	Elementary mechanics, Heat &Properties of Matter	3	C	
PHY 191	Introductory Physics practical I	1	C	
CHM 103	Introductory Physical Chemistry	2	C	
	Total Credit	**17**		
2nd Semester				
BIO 192	General Biology Practical 11	1	C	

BIO 102	General Biology 11	2	C	
GST 102	Use of English and Communication Skills II	2	C	
CHM 102	Introductory Organic Chemistry	2	C	
CHM 192	Introductory Chemistry Practical II	1	C	
PHY 102	Electricity, Magnetism & Modern Physics	3	C	
PHY 192	Introductory Physics practical II	1	C	
ESM 102	The Nigerian Environment	2	C	
MTH 102	Elementary Mathematics II	3	C	
MTH 103	Elementary Mathematics III	3	C	
CIT 102	Software Application Skills	3	C	
	Total Credit	**24**		

YEAR II

1st Semester

BIO 201	Genetics 1	2	C
BIO 203	General Physiology 1	2	C
BIO 205	Introductory Developmental Cell Biology	3	C
BIO 207	Lower Invertebrates	2	C
BIO 209	Chordates	3	C
BIO 211	Coelomate Invertebrates	2	C
BIO 213	Chemistry of Amino Acids and Proteins	2	C
BIO 215	General Biochemistry Laboratory 1	1	C
BIO 217	General Microbiology	3	E
GST 201	Nigerian Peoples and Culture	2	C

GST 203	Introduction to Philosophy & Logic	2	C
	Total Credit	**24**	
2nd Semester			
ESM 112	Introductory Ecology	2	C
BIO 204	Biological Techniques	2	C
BIO 206	Statistics for Agriculture and Biological Sciences	2	C
BIO 208	Seedless Plants	2	C
BIO 210	Seed Plants	2	C
BIO 212	Helminthology	2	C
BIO 214	Structure and Functions of Major Cell components	2	E
BIO 216	Chemistry of Carbohydrates, Lipids & Nucleic acids	2	C
BIO 218	General Biochemistry Laboratory 11	1	C
BIO 220	Fisheries and Wildlife	2	E
GST 202	Fundamentals of Peace Studies& Conflict Resolutions	2	C
	Total Credit	**21**	
	A minimum of one elective to be taken		

YEAR III

1st Semester

BIO 301	Genetics 11	2	C
BIO 303	General Cytology	2	C
BIO 305	Molecular Biology	2	C
BIO 307	Evolution	2	C
BIO 309	Plant Breeding	1	C
BIO 311	Mycology	2	C
BIO 313	Animal Ecology	2	E
BIO 315	Introductory Nematology	2	C
GST 301	Entrepreneurship Studies I	2	C
	Total credits	**17**	
2nd Semester			
BIO 302	Field Course 1	1	C
BIO 304	General Ecology	2	E
BIO 306	General Physiology 11	2	C
BIO 308	Biogeography	2	C
BIO 310	Protozoology	2	C
BIO 312	SIWES	6	C
BIO 314	Animal Behaviour	2	C
BIO 316	Introduction to Bioinformatics	1	C
BIO 318	Immunology and Immunochemistry	3	E
BIO 320	Microbial Ecology	3	E
	Total credit	**24**	
	A minimum of one elective to be taken		

BIO 312 SIWES (Choose only 1 from the following areas):

- **Environmental Pollution**
- **Pest Control**
- **Animal and Public Health**
- **Radiation Biology**
- **Biotechnology**

YEAR IV

1st Semester			
BIO 400	Research Project	6	C
BIO 401	Field Course 11	2	C
BIO 403	Population Genetics	2	C
BIO 405	Hydrobiology	2	C
BIO 407	Basic Entomology	2	C
BIO 409	Research Seminar	2	C
BIO 411	Parasitology	2	C
BIO 413	Developmental Biology	2	E
BIO 415	Virology and Tissue Culture	2	E
	Total Credit	**22**	
	A minimum of one elective to be taken		
2nd Semester			
BIO 402	Cytogenetics of Plants	2	C
BIO 404	Systematic Biology	3	C
BIO 406	Parasitology& Immunology	2	E

BIO 408	Soil Ecology	2	C
BIO 410	Fisheries & Aquaculture	3	C
BIO 412	Wildlife Ecology and Conservation	3	C
BIO 414	Applied Entomology	3	E
BIO 416	Industrial Microbiology	3	E
	Total credits	**21**	
	A minimum of one elective to be taken		

DETAILED PROGRAMME PROPOSAL (DPP)

GST101: USE OF ENGLISH AND COMMUNICATION SKILLS 1 (0 UNIT)

Listening enabling skills; Listening and comprehending; comprehension; note-taking and information retrieval, including data, figures, diagrams and charts; listening for main idea, interpretation and critical evaluation. Effective reading: skimming and scanning; Reading and comprehension at various speed levels; Vocabulary development in various academic contexts; Reading diverse texts in narratives and expository; Reading and comprehending passages with tables; Scientific texts; Reading for interpretation and critical evaluation.

GST102: USE OF ENGLISH AND COMMUNICATION SKILLS I1 (0 UNIT)

Writing paragraphs; Topic sentence and coherence; Development of paragraphs; illustration; Description; cause and effect including definitions; Formal letters: essential parts and stylistic forms; complaints and requests; jobs; ordering goods Letters to government and other organizations; Writing reports; reporting events, experiments, writing summaries

GST107: THE GOOD STUDY GUIDE (0 UNIT)

Getting started: How to use the book, why read about skills, getting yourself organised ; what is studying all about, reading and note taking; Introduction, reactions to reading, your reading strategy, memory, taking notes, conclusion. Other ways of studying: Introduction, learning in

groups, talks and lectures, learning from TV and radio broadcasts, other study media. Working with numbers; Getting to know numbers, describing the world, describing with the tables, describing with diagrams and graphs; What is good writing? The Importance of writing, what does an essay look like, what is a good essay? Conclusion. How to write essays: Introduction, the craft of writing, the advantages of treating essay writing as a craft, making your essay flow, making a convincing case, the experience of writing. Preparing for examination.

BIO 101 GENERAL BIOLOGY I (2 UNITS)

Characteristics of living things; cell as the basic unit of living things, cell structure, organization, cellular organelles, tissues, organs and systems. Classification of living things, general reproduction and concept of inter-relationships of organism. Heredity and evolution. Elements of ecology (introduction) and habitats.

BIO 102 GENERAL BIOLOGY II (2 UNITS)

Systematic studies of diversity of life including monera, protista, plants (Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and angiosperms) and animals (Protozoa, Platyhelminthes, Annelids, Arthropods, Fishes, Amphibians, Reptiles, Birds and Mammals) based on similarities and differences in external morphology. Taxonomic divisions of plant and animal kingdoms. Ecological adaptations of these forms.

BIO 191 GENERAL BIOLOGY PRACTICAL I (1 UNITS)

What practical work in biology involves. Laboratory organization. Handling common laboratory equipment. Microscopic handling and maintenance. Making microscopic measurements. Procuring animal materials for practicals. Killing, preserving and maintaining animal materials. Procuring plant materials. External features of plants (differences and similarities). Preparation of temporary slides. Preparation of stains and reagents. Techniques for microbial culture and grain staining. Setting up demonstration for physiological processes in plants. Setting up apparatus for demonstrating physiological processes in animals. Preparation required for dissection.

BIO 192 GENERAL BIOLOGY LABORATORY II (1 UNITS)

Observation and description of the morphological and diagnostic features as well as the differences among the different phyla of the plant, animal, archebacteria, eubacteria, fungi and protista kingdoms. Identification of the taxonomic hierarchy of the members of the above groups. Study of the structure and functions of their parts and habitats specifications

CHM 101:INTRODUCTORY INORGANIC CHEMISTRY (2 UNITS)

Hypothesis, theory and law with appropriate illustrations, Nature of matter – 3 states of matter, Atomic structure, electronic energy levels and orbital. Periodic classification of elements and its relationship to their electronic configurations, Chemical bonding, Survey of properties and trends in groups I, II, IV, VI and transition metal,

CHM 102: INTRODUCTORY ORGANIC CHEMISTRY (2 UNITS)

Simple reactions of hydrocarbons, alcohols, and acids. Petroleum chemistry, Oils and fats, hydrogenation of oils, polymer and biologically important molecule.

CHM 103: INTRODUCTORY PHYSICAL CHEMISTRY (2 UNITS)

Mole concepts and calculations based on it, methods of expressing concentrations, Chemical Kinetics and equilibrium, and related calculations, Important application of equilibrium – pH, solubility products and solubility of ionic solids, Thermo chemistry and simple calculations based on Hess's law, Electrochemistry and working of various cells, Brief mentions of corrosion; chemical thermodynamics; $\Delta G = \Delta H - T\Delta S$

CHM 191: INTRODUCTORY PRACTICAL CHEMISTRY I (1 UNIT)

Practical based of CHM 101 and CHM 103: Cations and anions – identification, Acid- base titrations, Redox reactions and determinations

CHM 192:INTRODUCTORY PRACTICAL CHEMISTRY II (1 UNIT)

Practical based on general chemistry CHM 101 and introductory organic chemistry I CHM 102- Determination of melting and boiling points and reaction of functional groups.

CIT 101: COMPUTERS IN SOCIETY (2 UNITS)

What is Computer, Types of Computer, History of Digital Computer, Element of a Computer : Hardware and Software. How to work with a computer. Operating System Windows Files word processing, copying a text, saving, Changes to a document and Formatting, spelling checker and introduction to Printing a document. Spread sheet, Entering and correcting data. Using Formula, Numeric Formats Creating Charts. Types of Charts Power Points and presentation. Networking, Internet and E-mail. Reading and responding to an E-mail message.

CIT 102: SOFTWARE APPLICATION SKILLS (2 UNITS)

Brief description of the computer system: CPU, I/O devices; operating systems; computer file management; Computer software: overview, types, etc.; Application software: common application software; Using Microsoft Word, Using Microsoft Excel, Features of Database applications and Microsoft Access; Statistical analysis applications: Using SPSS software; Introduction to Desktop Publishing applications; Computer applications in the Sciences; Managing the computer system with the control Panel.

ESM 102: THE NIGERIAN ENVIRONMENT (2 UNITS)

General description of the natural, physical features of Nigeria: Vegetation, climate and climatic changes within the geographical expression; Geographical distribution of people and natural recourses. Brief description of economic importance of these features. Exploration and exploitation of natural resources. Brief impact of these on the environment

ESM 112: INTRODUCTORY ECOLOGY (2 UNITS)

General consideration of ecosystems including influence and interaction of human beings with their environments. Similarities, differences of ecosystems. Characteristics and ecological adaptations of various forms life.

MTH 101 ELEMENTARY MATHEMATIC I: (3 Units)

Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers; integers, rational and irrational numbers, mathematic I, induction real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand Diagram. Re Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formalae.

MTH 102 ELEMENTARY MATHEMATICS II: (3 Units)

Calculus: Function of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; Integration as an inverse of differentiation. Methods of integration, Definite integrals. Application to areas, volumes.

PHY 101 GENERAL PHYSICS I: (3 Units)

(Mechanics, Thermal Physics and Waves)
Space and Time, Units and dimension, Kinematics; Fundamental Laws of Mechanics, statics and dynamics; work and energy; Conservation laws. Elasticity; Hooke's law, Young's shear and bulk moduli, Hydrostatics; Pressure; bouyance, Archimedes' Principles., Surface tension; adhesion, cohesion, capilarity, drops and bubbles. Temperature; heat; gas laws; laws of thermodynamics; kinetic theory of gases. Sound, Applications.

PHY 102 GENERAL PHYSICS: (3 Units)

(Electricity, Magnetism and Modern Physics)

Electrostatics; conductors and currents; dielectrics; magnetic fields and induction; Maxwell's equations; electromagnetic oscillations and waves; Applications.

PHY 191: INTRODUCTORY PRACTICAL PHYSICS I (1 UNIT)

Graphs, Measurement, Error Analysis, Determination of Acceleration due to Gravity by Means of Simple Pendulum, Determination of force constant of a spiral spring, Determination of effective mass of a spiral spring and the constant, Determination of surface tension of water, Determination of specific latent heat of fusion of ice, Determination of the co-efficient of limiting static friction between two surfaces, Determination of the co-efficient of static friction on two surfaces using an inclined plane, Determination of Relative Density of kerosene using the specific Gravity Bottle, Determination of the Relative Density of a Granular substance not soluble in water using the specific gravity bottle.

PHY 192: INTRODUCTORY PRACTICAL PHYSICS II (1 UNIT)

Refraction through the glass block; Image formed by a concave mirror; Determination of the focal length of the convex mirror; Refraction through the triangular prism; Determination of the focal length of a converging lens and the refractive index of groundnut; Determination of resistance of resistors in series and in parallel in simple circuits; Determination of internal resistance of a dry cell using a potentiometer; To compare the E.M.F. of cells using potentiometer; Determine the unknown resistance of a resistor using Wheatstone Bridge; To determine the relationship between current through a Tungsten and a potential applied across it.

GST201 NIGERIAN PEOPLES AND CULTURE (2 UNITS)

Nigerian history, culture and arts in pre-colonial times; Nigerians' perception of their world; culture areas of Nigeria and their characteristics; evolution of Nigeria as a political unit; indigene/settler phenomenon; concepts of trade; economic self- reliance; social justice; individual and national development; norms and values; negative attitudes and conducts (cultism and related vices); re-orientation of moral and national values; moral obligations of citizens; environmental problems.

GST 203: INTRODUCTION TO PHILOSOPHY AND LOGIC (0 UNIT)

General introduction to logic; clarity of thought, expression and arguments as basis for conclusions; fundamentals of logic and critial thinking; types of discourse; nature of arguments; validity and soundness; techniques for evaluating arguments; distinction between inductive and deductive inferences; etc. Illustrations from familiar texts, including literature materials, novels, law reports and newspaper publications.

BIO 201 GENETICS I (2 UNITS)

Hereditable and non-hereditable characteristics of living organisms, chromosomes, genes, the chromosome theory of inheritance, the chromosome structure of the Eukaryotes and Prokaryotes. Mendel's laws. Genotype, phenotype, dominance, alleles, Linkage, crossing-over, sex-linkage, sex chromosomes and sex determination. Application of genetics in agriculture and medicine.

BIO 203 GENERAL PHYSIOLOGY I (2 UNITS)

Physical and chemical processes in animals and plants; diffusion, osmotic pressure and osmolarity. Water potential, turgor, plasmolysis, Gibbs-Donan relationship. Gas exchange, partial pressures (Tension), Hydrogen-ion concentration (Ph). Henderson Hasselbach equation, buffers in physiology. Nutrition; photo-autotrophism, heterotrophism (essential requirements of each), Respiration and photosynthesis; RQ and QIO in relation to metabolism, photosynthesis, oxygen and carbon dioxide exchange.

BIO 204: BIOLOGICAL TECHNIQUES (2 UNITS)

The course is geared towards introducing students to scientific methods using topics to illustrate ways and means of Biological research. Types of microscopes and their uses. Preparation of microscopic slides. Examination of materials. Dissection guides. Microtomy and hand sectioning. Photometry, Colorimetry. Chromatography. Conductometry. The course will also introduce students to what is research and the techniques of writing scientific reports through developing critical thinking and testing hypotheses, evaluating original research papers and expressing ideas.

BIO 205 INTRODUCTORY DEVELOPMENTAL CELL BIOLOGY (3 UNITS)

History and present trends in cell biology. Reproductive cell division, differentiation and growth of cells. Molecular basis of cell structure and development. Proteins and nucleic acids.

BIO 206 STATISTICS FOR AGRICULTURE AND BIOLOGY (2 UNITS)

Use of statistical methods in Biology and Agriculture. Continuous and discrete variables, Sampling procedure. Sample size. Presentation of statistical results. Frequency distribution. Law of probability, the binomial, Poisson and normal frequency distributions. Estimations and Tests of Hypothesis. Design of simple Agricultural and Biological experiments. Analysis of variance and co-variance, simple regression and corelation, contingency tables, some non-parametric tests. The use of statistical packages such as SPSS and Minitab in statistical analysis.

BIO 207 LOWER INVERTEBRATES (2 UNITS)

Systematic approach to invertebrates morphology and levels of organization. Classification of Protozoa, Rhizopoda, Apicomplexa, Sarcomastigophora, Ciliophora, Parazoa; Porifera. Metazoan; Cnidaria, Platyhelminthes, Nematode, Annelida, Mollusca, Arthropoda, Echinodermata with emphasis on the differences and similarities among the groups; adaptive features to mode of life and their economic importance.

BIO 208 SEEDLESS PLANTS (2 UNITS)

Account of systematics, morphology and reproduction, life histories and ecology of Algae, Fungi, Bryophytes and Pteridopytes, including fossils

BIO 209 CHORDATES (3 UNITS)

Evolution, classification and general characteristics of vertebrate phyla. Evolution and adaptive radiation. Zoogeography.

BIO 210 SEED PLANTS (2 UNITS)

Detailed account of the origin and evolution of seed plants (angiosperms), the mode of reproduction, vascular elements, morphology and anatomy.

BIO 211 COELOMATE INVERTEBRATES (2 UNITS)

Organization and Biology of higher metazoan groups. Anatomy and sexual dimorphism of the metazoans. Economic importance.

BIO 212 HELMINTHOLOGY (2 UNITS)

General classification and characteristics of trematodes, cestodes and nematodes, studies of their morphology and life cycles, epidemiology, pathogenesis and progenetic forms, diagnosis, control methods and economic importance. Practical components should give emphasis on parasite morphology and diagnostic techniques used to identify parasite species.

BIO 213 CHEMISTRY OF AMINO ACIDS AND PROTEINS (2 UNITS)

Structure, properties and classification of amino acids, pH, pka and buffer, peptide. Reactions of specific amino acids, separation of sequence of peptides, chemistry of proteins including their

structural level and types of bonds stabilizing them, properties, functions and classifications of proteins, enzymes, vitamins and co-enzymes

BIO 214 STRUCTURE AND FUNCTION OF MAJOR CELL COMPONENTS (2 UNITS)

Prokaryotic versus Eukaryotic cells, elementary treatment of membrane structure (fluid mosaic model) and functions in the eukaryotic cells. Transport across membranes (passive and active), the regulation of the intracellular environment, intracellular organelles, their brief treatment of structure and functions. Preparations of sub-cellular inclusions: chlorophyll, porphyrins and carotenoids

BIO 215 GENERAL BIOCHEMISTRY LABORATORY I (I UNIT)

Introduction to laboratory and laboratory equipment. Safety, housekeeping, washing and drying of glassware in the laboratory. Accuracy of measurement and transfer of liquids and solids. Introduction to photometry and colorimetry. Standard curve in absorption spectra. pH and buffer systems. Qualitative and quantitative tests for amino acids and proteins. Biuret method and estimation of proteins.

BIO 216 CHEMISTRY OF CARBOHYDRATES, LIPIDS AND NUCLEIC ACIDS (2 UNITS)

Classification of physical properties of carbohydrates, structure of glucose, projection and perspective formular, structure of properties of other monossacharides, brief treatment of dissacharides and polyssacharides. Chemistry, classification and properties of lipids. Methods of analysis of lipids, lipoprotein, membrane and membrane structure. Chemistry of nucleic acids (Bases, Sugar and Phosphate acid). Structure and roles of RNA and DNA

BIO 217 GENERAL MICROBIOLOGY (3 UNITS)

Historical aspects, scope of microbiology, general characteristics of microorganisms, growth and reproduction of microorganisms; sterilization and disinfection; brief survey of microbes as friends and foes. Systematic classification of bacteria fungi, viruses, etc. Microbial variation and heredity; biological and biochemical reactions of microorganisms; cycles of elements in nature; Nitrogen fixation.

BIO 218 GENERAL BIOCHEMISTRY LABORATORY II (I UNIT)

General texts in concentration, Reaction of carbohydrate, thin layer of chromatographic separation of sugar. Estimation of glucose in biological fluid (blood and urine). Analysis of lipids for double bond and free fatty acids. Separation by thin layer chromatography. Separation and purification of nucleic acids. Estimation of DNA and RNA. Estimation of phosphate and titratable acidity.

GST301: ENTREPRENEURIAL STUDIES I (2 UNITS)

Introduction to entrepreneurship and new venture creation; Entrepreneurship in theory and practice; The opportunity, Forms of business, Staffing, Marketing and the new venture;

Determining capital requirements, Raising capital; Financial planning and management; Starting a new business, Feasibility studies; Innovation; Legal Issues; Insurance and environmental considerations. Possible business opportunities in Nigeria. knails, screws making Dyeing/Textile blocks paste making.

BIO 301 GENETICS II (2 UNITS)

Selected topics from population genetics, cytogenetics, microbial genetics, animal and plant genetics. Biochemical and biomedical genetics, human genetics. Further consideration of various deviations from basic principles, pedigree analysis, gene interactions.

BIO 302 FIELD COURSE I ((1 UNIT)

Biological sampling techniques in local habitats. Students may visit and inspect laboratories, research institutes and industrial plants concerned with medical, biotechnological processes and related fields. A written report must be submitted to the school for assessment.

BIO 303 GENERAL CYTOLOGY (2 UNITS)

Light, phase-contrast, Dark-field and Electron Microscopy, Autoradiography, Florescence. Cell cycles. Introductory cytogenetics. History and present trends in cell biology. Reproduction and cell division, cell differentiation and growth of cells. Molecular basis of cell structure and developmental cell biology. Proteins and Nucleic acids.

BIO 304 GENERAL ECOLOGY (2 UNITS)

The ecosystem approach to the study of ecology. Types of interaction. Energy flow and nutrient cycling, population structure, population dynamics: birth and death rate, life tables and longevity. Communities in ecosystem. Influence of man.

BIO 305 MOLECULAR BIOLOGY (2 UNITS)

Genetics studies of microorganism, metabolic pathways, genes and chromosomes, nucleic acids (RNA and DNA), replication, transcription, gene expression and sequencing, protein synthesis, genotype, genetic code, 27. BIO 306 GENERAL PHYSIOLOGY II (2 UNITS)A general study of osmo-regulation, excretion, transport, homeostasis, and their coordination in animals. Plant-water relationships, growth regulation. Physiological aspectsof crop yield

BIO307 EVOLUTION (2 UNITS)

Theories of evolution, Population genetics, gene frequency/equilibrium. Hardey Weinberg Principle, Polymorphism. Variation; types and causes, reshuffling of genes, Mutation; origin and types. Polyploidy, isolation mechanism, adaptation; origin of life; evolution of organic molecules, Polymer synthesis; isolation and replication, the first cell, origin of species. Evidence of evolution; fossils (carbon dating), comparative anatomy, Taxonomy, Comparative-biochemistry, physiology, immunology, cell biology. Evolution of the plants, role of oxygen, multicellular development. Phylogeny, geological periods and epochs.

BIO 308 BIOGEOGRAPHY (2 UNITS)

Distribution of world flora, floristic regions of the world and zoogeographic regions of the world, comparision of tropical and temperate flora, dispersal and colonization of land by plants and animals, island biogeography, relationships between vegetation, soil types and climate, relationships between plant distribution and world fauna

BIO 309 PLANT BREEDING (1 UNIT)

Importance of plant breeding, cytological principles of breeding, heterosis, inbreeding consequences, incompatibility mechanisms, sterility, breeding methods, disease and pest resistance and their inheritance, major farm and domestic plants and the breeding practices used to sustain desired qualities.

BIO 310 PROTOZOOLOGY (2 UNITS)

Classification and evolutionary relationships of the protozoa. Macro and Micro structure of protozoa. The role of protozoa in ecosystems. The ecology of protozoa, their physiology and biochemistry. Life histories of protozoa of medical and veterinary importance, with emphasis on tropical species; the pathology, epidemiology and control of protozoan infections.

BIO 311 MYCOLOGY (2 UNITS)

Classification, structure, life cycles and physiology of fungi, their economic importance.

BIO 312 SIWES (6 UNITS)

This is a compulsory course designed to train the students on the Industrial application of Biological knowledge. The course will be undertaken within the country at laboratories, research institutes and industrial plants concerned with biological, medical, biotechnological processes and related fields. Each student will be supervised at least once while on attachment by a designated staff of the school.

BIO 313 ANIMAL ECOLOGY (2 UNITS)

The ecology of local terrestrial and aquatic animals; growth rate and age structure of animal populations; natality and mortality, survivorship curves. Life tables and K-factor analysis. Competition. The natural regulation of animal numbers. Population cycles. The dynamics of predator-prey systems. The ecology of African mammals. Behavioural ecology.

BIO 314 ANIMAL BEHAVIOUR (2 UNITS)

History of ethology. Reflex and complex behaviour. Orientation and taxes. Fixed action patterns, releasers, motivation and driver. Displays, displacement activities and conflict behaviour. Learning communication and social behaviour. The social behaviour of primates. Hierarchical organization. The physiology of behaviour. Habitat selection, homing and navigation. Courtship and parenthood. Biological clocks.

BIO 315 INTRODUCTORY NEMATOLOGY (2 units)

Principal characteristics of nematodes, morphology, position and outlines of classification of nematodes. Morphology and biology of important plant parasitic nematodes and their economic

importance. Nematological techniques. General principles and methods of controlling nematodes.

BIO 316 INTRODUCTION TO BIOINFORMATICS (1 UNIT)

Definitions, Database Hierarchies, Sequence Databses, Tools & databases, BLAST, Nucleotide and Amino acids Alignments, Sequence Analysis, Gene mining, Phylogenetic analysis, Gene Annotation, Data Analysis

BIO 318 IMMUNOLOGY AND IMMUNOCHEMISTRY (3 UNITS)

Basic concepts ofimmunology, structure of antigenic determinants cellular response, genetics of response to antigenic stimulation. Structure and classification of immunolglobulins and antibodies. Mechanisms of antibody formation. Antigen-antibody interactions; role of lymphoid tissues and thymus in immuno-responses. Hypersensitivity, immunopathology, auto-pathology, auto immunology, tumor and transplantation immunology, immunoprophylaxis modern techniques in immunology and immunochemistry. Principles of Chemothorapy. History of chemotherapy. Basic pharmaco dynamics and pharmacokinetics. Chemotherapeutic agents: antibacterial, antifungal, antiviral antiprotozoan and anti helminths. Modes of action of antimicrobials. Chemotherapy of specific diseases. Drug bio-assays and sensitivity tests

BIO 320 MICROBIAL ECOLOGY (3 UNITS)

Microbes and Ecological Theory. Physiological, morphological and genetic adaptations of microorganisms to their environment. Microbial interactions. Microorganisms in ecosystems. Microbial bio-conversions

BIO 400 RESEARCH PROJECT (6 UNITS)

Each student, in consultation with a Departmental academic staff, will select a specific problem in biology discipline to be his/her project and will write a research proposal at the beginning of the first semester of level 400. The student will learn how to design, carry out, and evaluate the results of a research project in the university laboratory and/or in the field and at the end, to write and present a seminar on the results of his research project to graduates and staff of the School.

BIO 401 FIELD COURSE II (2 UNITS) To undertake field trips in fulfillment of certain courses such as entomology, hydrobiology, ecology, helminthology, parasitology e.t.c. Students may visit and inspect laboratories, research institutes and industrial plants concerned with medical, biotechnological processes and related fields.

BIO 402 CYTOGENETICS OF PLANTS (2 UNITS) Aspects of cell and nuclear divisions, morphology and behaviour of chromosomes, chromosomal aberrations and polyploidy.

BIO 403 POPULATION GENETICS (2 UNITS) Population concept of evolution: genetic equilibrium. Natural selection, analysis of gene frequencies, genetic variation in population, divergent speciation, isolating mechanism, migration and genetic drift, adaptive drift, adaptation and survival.

BIO 404 SYSTEMATIC BIOLOGY (3 UNITS) Principles and methods in biosystematics. Concept of Taxonomic characters. Morphological anatomical, palynological, embryological, cytological and physiochemical characters. Principles used in the delination of taxa and attribution of rank. Numerical taxonomy. Concepts of specific and intraspecific categories. Morphological study of selected plant families to illustrate evolutionary tendencies and phylogenetic relationships

BIO 405 HYDROBIOLOGY (2 UNITS) Physical and chemical aspects of freshwater environments, spatial and temporal pattern of light, temperature and Oxygen. Fresh water flora and fauna with particular reference to West Africa. Plankton, benthic invertebrates, fish and plant communities, production and energy flow. Characteristics of African freshwater. Case studies of various African fresh water habitats: a tropical swamp (Lake Chilwa), a warm spring (Wikki spring), an ancient lake (Lake Tanganyika), a new man-made lake (Lake Kainji and Tiga Lake). Problems associated with tropical freshwater, eutrophication, pollution and water-linked diseases. The practical component of the course should include basic techniques for isolation and characterisation of environmental soil and water microfauna, including methods for enumeration and measurement of physiological activity.

BIO 406 PARASITOLOGY AND IMMUNOLOGY (2 UNITS) Nature of immunity. Innate immunity (non specific defence mechanisms). Antigen. Acquired immunity. Hypersensitivity. Immunology of tissue transplantation. Infection, immunity and protection. Autoimmunity. Interaction of antibody with antigens.

BIO 407 BASIC ENTOMOLOGY (2 UNITS) Insect evolution, classification and distribution. Organization of external structure. Ingestion, digestion, excretion, blood circulation and nervous system. Behavior and ecology of social insects.

BIO 408 SOIL ECOLOGY (2 UNITS) Classification and characterization of soils. Chemical components and analysis of soils and plant tissue. Plant, soil and water relationships. Physical and chemical properties of soil. Detritus organisms. Cycling of mineral and nutrient pool.

BIO 409 RESEARCH SEMINAR (2 UNITS) This is usually a scholarly research paper that students write on a specific topic chosen in the field of Biological Sciences under the supervision of a designated academic staff. The topic will be researched, written in a typical scientific format and presented before academic staff in the Department for assessment.

BIO 410 FISHERIES AND AQUACULTURE (3 UNITS) The gross external morphology of bony and cartilaginous fishes; Basic functions of piscine organs and major systems in fish; food and feeding habits of fishes; Age and growth determination, fecundity; fish culture techniques e.g. Monoculture, Polyculture, pond construction and management, hatchery, management; fish feed formulation; induced breading and hybrization techniques. Major fish processing techniques

BIO 411 PARASITOLOGY (2 UNITS) Principles of Parasitological and Zoo-economic effects. Introduction to parasitism history and evolution of parasitism, types of parasitism, host-parasite relationships. Parasitic protozoa, trematodes, cestodes, nematodes, acanthocephalans, leeches and arthropods.

BIO 412 WILDLIFE ECOLOGY AND CONSERVATION (3 UNITS) General principles of ecosystem management, wildlife disease, principles of wildlife management. Wildlife in Nigeria;

conservation policies, problems and prospects. World wildlife resources and their protection

BIO 413 DEVELOPMENTAL BIOLOGY (2 UNITS) Gametogenesis, fertilization, morulla formation, invagination, organogenesis, and general embryology.

BIO 414 APPLIED ENTOMOLOGY (3 UNITS) Introduction to the systematics and biology of the major economically important insets and mites, their roles as pests and parasites. Chemical pest control methods, their formulations, metabolisms, behaviour in the environment problems of resistance, intergrated pest management. Alternative control strategies (insect-plant co-evolution, plant resistance and insect numbers, insect-insect relationships, manipulating insect behaviour, semio-chemicals, sterile-insect-technique. Pest forecasting.

BIO 415 VIROLOGY AND TISSUE CULTURE (2 UNITS) Viruses pathogenic to man and animals with emphasis on virulence types of diseases caused methods of control. Experiments with bacteriophages and representative animal viruses to demonstrate characteristics of viruses and viral virulence. Methods of viral cultivation and identification, with special reference to tissue culture techniques

BIO 416 INDUSTRIAL MICROBIOLOGY (3 UNITS)
Nature of Industrial Microbiology. Microorganisms of industrial importance. Aspects of the biology of molds, yeasts, Actinomycetes and viruses of importance in various fermentations. Culture techniques and maintenance of selected cultures. Mutation, strain selection and development, hybridisation, media formulation and economics. Optimization of fermentation media at laboratory scale. Perimeter design operation. Antifoams. Aspects of biochemical engineering. Patents and patent

B.Sc. CHEMISTRY PROGRAMME

Programme Code: 5212

List of Academic Staff

S/N	Name of Staff	Rank/Designation	Qualification & Degree Status
1	Prof Femi Peters	Professor	BSc., MSc, Ph.D. Polymer Chemistry
2	Dr Emeka ogoko	Lecturer I	BSc. Chem., MSc Analytical Chem., Ph.D Analytical Chem.
3	Dr Henrietta Kelle (B.Sc,	Lecturer II	BSc. Industrial Chem., MSc. Pure & Industrial Chem., Ph.D Environmental Chem.
4	Miss Adiat Odunmbaku	Assistant Lecturer	BSc. Chem., MSc. Analytical Chem.
5	Mrs Bethel Ekute	Assistant Lecturer	BSc. Chemistry, MSc. Industrial Chemistry
6	Mrs Folasade Aderanti	Assistant Lecturer	BSc. Biochemistry, MSc Biochemistry
7	Mrs Kelechi Uleanya (B.Sc, M.Sc)	Assistant Lecturer	BSc. Chemistry, MSc. Pure and Industrial Chemistry

PROGRAMME AND DEGREE AWARD REQUIREMENTS

4.0 Introduction The Chemistry Unit shall implement the missions of the Faculty of Sciences and the National Open University of Nigeria (NOUN), by providing world-class instruction (in an open-distance learning environment, ODL) and research in the chemical sciences. These efforts shall encompass chemistry and industrial chemistry, but shall become interdisciplinary in future. The Unit shall support and inform instruction and research in allied areas such as the biological sciences, physics & material sciences, agriculture, environmental sciences, and public policy. Already, the Unit provides constituent courses to Science Education, Environmental Sciences, Agriculture and Mathematical Sciences.

At present, the Unit offers only one programme - The B.Sc (Hons) Chemistry programme. This programme is intended for students who are primarily interested in careers as professional Chemists or wish a thorough grounding in chemistry in preparation for professional or graduate school in chemistry and other disciplines.

Programme Duration: 4 –year B.Sc(Hons) Chemistry

3 –year B.Sc. (Hons) Chemistry (Direct entry)

4.2.1 Prerequisite Course : Lower level courses that have direct relevance to the higher one must be passed before registering higher one.

4.2.2 Registration procedure: Students' generate remital from their portal, take the remital to approved bank where they are issued receipt, which they use to log on to their portal for further processing of the registration.

4.2.3 Opening and Closing of the Course Registration portal: As specified by the university.

4.3 Course re-registration: Student pay for only exam re-registration, see ICT, MIS for stepwise process.

4.4 Add and/or Drop courses: Available in students portal, students are to print and process from their portal through the Centre Director to ICT.

4.5 Eligibility for Graduation: To graduate, a student shall have undergone at least 6-8 semesters of study depending on entry point, including field practical training. Students are to pass a minimum of 120 credit units for a 4-year B.Sc (Chemistry) programme; and 90 units for a 3-year B.Sc (Chemistry) programme, excluding the GST courses. The submission of an undergraduate project thesis based on a supervised research is a graduation requirement which cannot be compromised.

4.6 Research Projects: At the commencement of 400 level students' are expected to submit their project topic for approval.

4.7 Grading, Moderation and Mode of Submission of Projects

4.7.1 Grading of research projects: Student's project are graded by their supervisor, moderated at the department.

4.7.2 Mode of Submission of Projects: Projects and scoresheet are submitted to the faculty through the study centre.

4.10 Degree Award Requirements: To graduate, a student shall have undergone at least 6-8 semesters of study depending on entry point, including field practical training. Students are to pass a minimum of 120 credit units for a 4-year B.Sc (Chemistry) programme; and 90 units for a 3-year B.Sc (Chemistry) programme, excluding the GST courses. The submission of an undergraduate project thesis based on a supervised research is a graduation requirement which cannot be compromised.

Course Outline Structure:

Year I

First Semester

Code	Course Title	Status	Units
GST101	Use of English and Communication Skills I	C	0
GST107	The Good Study Guide	C	0
BIO 101	General Biology I	C	2
BIO 191	General Biology Practical 1	C	1
CHM 101	Introductory Inorganic Chemistry	C	2
CHM 103	Introductory Physical Chemistry	C	2
CHM 191	Introductory Practical Chemistry I	C	1
CIT 101	Computers in Society	C	2
CIT 143	Introduction to Data Organisation and Management	C	2
MTH 101	Elementary Mathematics I	C	3
MTH 103	Elementary Mathematics III	C	3
PHY101	Elementary Mechahhnnics, Heat and Properties of Matter	C	2
PHY191	Introductory Practical Physics I	C	1
	TOTAL		**21**

Second Semester

Code	Course Title	Status	Units
GST102	Use of English and Communication Skills II	C	0
BIO 102	General Biology II	C	2

BIO 192	General Biology Laboratory II	C	1
CHM102	Introductory Organic Chemistry	C	2
CHM192	Introductory Practical Chem. II	C	1
CIT102	Software Application Skills	C	2
MTH102	Elementary Mathematics II	C	2
PHY 102	Electricity, Magnetism and Modern Physics	C	3
PHY 192	Introductory Practical Physics II	C	1
STT102	Introductory Statistics	C	2
	TOTAL		**16**

Year II

First Semester

Code	**Course Title**	**Status**	**Units**
GST201	Nigerian Peoples and Cultures	C	0
GST203	Introduction to Philosophy and logic	C	0
CHM201	Physical Chemistry II	C	2
CHM203	Organic Chemistry II	C	2
CHM205	Inorganic Chemistry II	C	2
CHM291	Practical Chemistry III- Inorganic	C	1
MTH281	Mathematical Methods I	C	2
BIO 213	Chemistry of Amino Acids and Proteins	E	2
	TOTAL		**11**

Second Semester

Code	Course Title	Status	Units
GST202	Fundamentals of Peace Studies & Conflict Resolutions	C	0
CHM202	Analytical Chemistry I	C	2
CHM204	Structure and Bonding	C	2
CHM292	Practical Chemistry IV - Physical and Organic	C	1
MTH212	Linear Algebra II	C	2
PHY202	Modern Physics I	C	2
PHY204	Electromagnetism	C	2
BIO 216	Chemistry of Carbohydrates and , Lipids & Nucleic acids	E	2
	TOTAL		**13**

Year III

First Semester

Code	Course Title	Status	Units
GST 301	Entrepreneur Studies 1	C	0
CHM301	Physical Chemistry III	C	3
CHM303	Inorganic Chemistry III	C	3
CHM305	Organic Chemistry III	C	3
CHM307	Atomic & Molecular Structure & Symmetry	C	3
CHM309	Organic Spectroscopy	C	2
CHM391	Practical Chemistry V Inorganic & Analytical	C	1
GST 301	Entrepreneur Studies	C	0

Students are to choose at least ONE of the courses below			
CHM311	Petroleum Chemistry	E	2
CHM315	Carbohydrate Chemistry	E	2
	TOTAL		**17**

Second Semester

Code	**Course Title**	**Status**	**Units**
CHM302	Polymer Chemistry I	C	2
CHM306	Instrumental Methods of Analysis	C	2
CHM312	Industrial Chemical Processes I	C	2
CHM314	Environmental Chemistry	C	2
CHM318	Natural Product Chemistry I	C	2
Students are to choose at least TWO of the courses below			
CHM304	Colour Chemistry and Technology	E	2
CHM316	Industrial Chemical Technology I	E	2
	TOTAL		**12**

Year IV

First Semester

Code	**Course Title**	**Status**	**Units**
CHM 401	Industrial Training	C	6
CHM 407	Reaction Kinetics	C	3

CHM 409	Electrochemistry	C	2
CHM 411	Project	C	6
CHM 413	Analytical Chemistry II	C	2
CHM 421	Heterocyclic Chemistry	C	2
CHM 423	Coordination Chemistry	C	3
	Students are to choose at least one of the courses below		
CHM417	Industrial chemical processes II	E	2
	TOTAL		**24**

Second Semester

Code	**Course Title**	**Status**	**Units**
CHM 400	Seminar	C	1
CHM406	Nuclear and Radiochemistry	C	2
CHM408	Polymer Chemistry II	C	2
CHM414	Photochemistry and Pericyclic Reactions	C	2
CHM416	Organic Synthesis	C	2
	Students are to choose at least one of the courses below		
CHM422	Natural Products Chemistry II	E	2
	TOTAL		**11**

GST101: USE OF ENGLISH AND COMMUNICATION SKILLS 1 (0 UNITS)

Listening enabling skills; Listening and comprehending; comprehension; note-taking and information retrieval, including data, figures, diagrams and charts; listening for main idea, interpretation and critical

evaluation. Effective reading: skimming and scanning; Reading and comprehension at various speed levels; Vocabulary development in various academic contexts; Reading diverse texts in narratives and expository; Reading and comprehending passages with tables; Scientific texts; Reading for interpretation and critical evaluation.

GST102: USE OF ENGLISH AND COMMUNICATION SKILLS I1 (0 UNITS)

Writing paragraphs; Topic sentence and coherence; Development of paragraphs; illustration; Description; cause and effect including definitions; Formal letters: essential parts and stylistic forms; complaints and requests; jobs; ordering goods Letters to government and other organizations; Writing reports; reporting events, experiments, writing summaries

GST107: THE GOOD STUDY GUIDE (0 UNITS)

Getting started: How to use the book, why read about skills, getting yourself organised ; what is studying all about, reading and note taking; Introduction, reactions to reading, your reading strategy, memory, taking notes, conclusion. Other ways of studying: Introduction, learning in groups, talks and lectures, learning from TV and radio broadcasts, other study media. Working with numbers; Getting to know numbers, describing the world, describing with the tables, describing with diagrams and graphs; What is good writing? The Importance of writing, what does an essay look like, what is a good essay? Conclusion. How to write essays: Introduction, the craft of writing, the advantages of treating essay writing as a craft, making your essay flow, making a convincing case, the experience of writing. Preparing for examination.

CHM 101: INTRODUCTORY INORGANIC CHEMISTRY (2 UNITS)

Hypothesis, theory and law with appropriate illustrations, Nature of matter – 3 states of matter, Atomic structure, electronic energy levels and orbital. Periodic classification of elements and its relationship to their electronic configurations, Chemical bonding, Survey of properties and trends in groups I, II, IV, VI and transition metal,

CHM 102: INTRODUCTORY ORGANIC CHEMISTRY (2 UNITS)

Simple reactions of hydrocarbons, alcohols, and acids. Petroleum chemistry, Oils and fats, hydrogenation of oils, polymer and biologically important molecule.

CHM 103: INTRODUCTORY PHYSICAL CHEMISTRY (2 UNITS)

Mole concepts and calculations based on it, methods of expressing concentrations, Chemical Kinetics and equilibrium, and related calculations, Important application of equilibrium – pH, solubility products and solubility of ionic solids, Thermo chemistry and simple calculations based on Hess's law, Electrochemistry and working of various cells, Brief mentions of corrosion; chemical thermodynamics; $\Delta G = \Delta H - T\Delta S$

CHM 191: INTRODUCTORY PRACTICAL CHEMISTRY I (1 UNIT)

Practical based of CHM 101 and CHM 103: Cations and anions – identification, Acid- base titrations, Redox reactions and determinations

CHM 192: INTRODUCTORY PRACTICAL CHEMISTRY II (1 UNIT)

Practical based on general chemistry CHM 101 and introductory organic chemistry I CHM 102- Determination of melting and boiling points and reaction of functional groups.

BIO 101: GENERAL BIOLOGY I (2 UNITS)

Characteristics of living things; cell as the basic unit of living things, cell structure, organization, cellular organelles, tissues, organs and systems.

Classification of living things, general reproduction and concept of inter-relationships of organism. Heredity and evolution. Elements of ecology (introduction) and habitats.

BIO 102 GENERAL BIOLOGY II (2 UNITS)

Systematic studies of diversity of life including monera, protista, plants (Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and angiosperms) and animals (Protozoa, Platyhelminthes, Annelids, Arthropods, Fishes, Amphibians, Reptiles, Birds and Mammals) based on similarities and differences in external morphology. Taxonomic divisions of plant and animal kingdoms. Ecological adaptations of these forms.

BIO 191 GENERAL BIOLOGY PRACTICAL I (1 UNIT) What practical work in biology involves. Laboratory organization. Handling common laboratory equipment. Microscopic handling and maintenance. Making microscopic measurements. Procuring animal materials for practicals. Killing, preserving and maintaining animal materials. Procuring plant materials. External features of plants (differences and similarities). Preparation of temporary slides. Preparation of stains and reagents. Techniques for microbial culture and grain staining. Setting up demonstration for physiological processes in plants. Setting up apparatus for demonstrating physiological processes in animals. Preparation required for dissection.

BIO 192 GENERAL BIOLOGY LABORATORY II (1 UNIT) Observation and description of the morphological and diagnostic features as well as the differences among the different phyla of the plant, animal, archebacteria, eubacteria, fungi and protista kingdoms. Identification of the taxonomic hierarchy of the members of the above groups. Study of the structure and functions of their parts and habitats specifications.

CIT 101: COMPUTERS IN SOCIETY (2 UNITS)

What is Computer, Types of Computer, History of Digital Computer, Element of a Computer : Hardware and Software. How to work with a computer. Operating System Windows Files word processing, copying a text, saving, Changes to a document and Formatting, spelling checker and introduction to Printing a document. Spread sheet, Entering and correcting data. Using Formula, Numeric Formats Creating Charts. Types of Charts Power Points and presentation. Networking, Internet and E-mail. Reading and responding to an E-mail message.

CIT 102: SOFTWARE APPLICATION SKILLS (2 UNITS)

Brief description of the computer system: CPU, I/O devices; operating systems; computer file management; Computer software: overview, types, etc.; Application software: common application software; Using Microsoft Word, Using Microsoft Excel, Features of Database applications and Microsoft Access; Statistical analysis applications: Using SPSS software; Introduction to Desktop Publishing applications; Computer applications in the Sciences; Managing the computer system with the control Panel.

CIT143: Introduction to Data Organisation and Management (2 Credit)

Data, Information and knowledge, knowledge management, Information Systems for Data Management, Language for Data Organisation, Data representation in the Computer, Data planning and policy making, Data definition and structures, Data arrangement, Grouping and Modelling, Data capture, acquisition and collection, Data quality control. Data storage media and organisation. Data storage and Computer Databases, Creating and using Databases, Data and Information retrieval concepts. Data protection and archiving. Data analysis and summarization. Designing and implementing Information Systems for Data Management.

MTH 101 ELEMENTARY MATHEMATIC I: (3 UNITS)

(ALGEBRA AND TRIGONOMETRY)

Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers; integers, rational and irrational numbers, mathematic I, induction real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand Diagram. Re Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formalae.

MTH 102: ELEMENTARY MATHEMATICS II: (2 UNITS)

Calculus: Function of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; Integration as an inverse of differentiation. Methods of integration, Definite integrals. Application to areas, volumes

MTH 103 ELEMENTARY MATHEMATICS III: (3 Units)

(Vectors, geometry and dynamics)

Geometric representation of vectors in 1-3 dimensions, components, direction cosines. Addition, Scalar, multiplication of vectors, linear independence. Scalar and vector products of two vectors. Differentiation and integration of vectors with respect to a scalar variable. Two-dimensional co-ordinate geometry. Straight lines, circles, parabola, ellipse, hyperbola. Tangents, normals. Elementary Mathematics IV. Impact of two smooth sphere, and of a sphere on a smooth sphere.

STT 102: INTRODUCTORY STATISTICS (2 UNITS)

Measures of Central Tendency and dispersion, (grouped and ungrouped); mean: - arithmetic and geometric, harmonic, median, mode quartiles, deciles, modes, relative and absolute dispersion, sample space and events as sets. Finite probability space properties of probability. Statistical independence and conditional probability. Tree diagram. Bayes theorem. Discrete and continuous random variables. Expectation, independent Bernoulli trials. Binomial Poisson and Normal distributions. Normal approximation to binomial and Poisson distribution, Hyper geometric.

PHY 101: Elementary Mechanics, Heat and Properties of Matter (2 UNITS)

Space and Time: Physical quantities: Units and dimensions of physical quantities; Kinematics: Uniform velocity motion, uniformly accelerated motion; Dynamics: Newton's laws of motion; Impulse and Linear Momentum, Linear Collision, Newton's universal law of gravitation; Work, energy and power; Conservation laws; Concept of mechanical equilibrium; Centre of mass and centre of gravity; Moment of a force; Rotational kinematics and dynamics: Torque; Moment of Inertia; angular momentum; Total mechanical energy. Simple harmonic motion

Heat and temperature, work and heat, Quantity of heat: heat capacities, latent heat; Thermal expansion of solids, liquids and gases; Gas laws, heat transfer; Laws of thermodynamics: Isothermal and Adiabatic changes, Carnot cycle; Application kinetic theory of gases; van der Waals gas.

Classification of matter into (solids, liquids and gases, forces between atoms and molecules, molecular theory of matter, Elasticity, plasticity, Hook’s Law, Young’s Shear and bulk Moduli) Crystalline and non-crystalline materials, Hydrostatics: pressure, buoyancy, Archimedes' principle; Hydro-dynamics-streamlines, Bernouli and Continuity equations, turbulence, Reynold’s number, Viscosity, laminar flow, Poiseuille’s equation; Surface tension, adhesion, cohesion, capillary, drops and bubbles.

PHY 102: ELECTRICITY, MAGNETISM AND MODERN PHYSICS (3 UNITS)

Electrostatics: Coulomb's law, Gauss's law, potential and capacitance, dielectrics, production and measurement of static electricity. Current: Ohm's law, resistance and resistivity, heating. Galvanometers, Voltmeters and Ammeters; D.C. circuits: sources of emf and currents, Kirchhoff's laws; Electrochemistry; The Earth's magnetic field; Magnetic fields and induction, Faraday's and Lenz's laws; Force on a current-carrying conductor. Biot-Savart law. Flemming's right and left-hand rules, motors and generators. A.C. Theory. Atomic structure; Production and properties of X-rays; Radioactivity; Photoelectric emission.

PHY 191: INTRODUCTORY PRACTICAL PHYSICS I (1 UNIT)

Graphs, Measurement, Error Analysis, Determination of Acceleration due to Gravity by Means of Simple Pendulum, Determination of force constant of a spiral spring, Determination of effective mass of a spiral spring and the constant, Determination of surface tension of water, Determination of specific latent heat of fusion of ice, Determination of the co-efficient of limiting static friction between two surfaces, Determination of the co-efficient of static friction on two surfaces using an inclined plane, Determination of Relative Density of kerosene using the specific Gravity Bottle, Determination of the Relative Density of a Granular substance not soluble in water using the specific gravity bottle.

PHY 192: INTRODUCTORY PRACTICAL PHYSICS II (1 UNIT)

Refraction through the glass block; Image formed by a concave mirror; Determination of the focal length of the convex mirror; Refraction through the triangular prism; Determination of the focal length of a converging lens and the refractive index of groundnut; Determination of resistance of resistors in series and in parallel in simple circuits; Determination of internal resistance of a dry cell using a potentiometer; To compare the E.M.F. of cells using potentiometer; Determine the unknown resistance of a resistor using Wheatstone Bridge; To determine the relationship between current through a Tungsten and a potential applied across it.

200 LEVEL

GST 201 NIGERIAN PEOPLES AND CULTURE (0 UNITS)

Nigerian history, culture and arts in pre-colonial times; Nigerians' perception of their world; culture areas of Nigeria and their characteristics; evolution of Nigeria as a political unit; indigene/settler phenomenon; concepts of trade; economic self- reliance; social justice; individual and national development; norms and values; negative attitudes and conducts (cultism and related vices); re-orientation of moral and national values; moral obligations of citizens; environmental problems.

GST 202 FUNDAMENTALS OF PEACE STUDIES AND CONFLICT RESOLUTION (0 UNITS) Meaning and nature of conflict; causes and types of conflicts; conflict analysis, management, resolution and transformation ;processes of conflict resolution

peace education: the role of communication and language in conflicts; importance of the rules of conflict intervention latent stage of conflict and possible responses

global issues and peace-building.

GST 203 INTRODUCTION TO PHILOSOPHY AND LOGIC (0 UNITS)

Nature and scope of philosophy, the traditional and special fields of philosophy; conceptions of the term 'philosophy; epistemology, metaphysics, ethics and logic

BIO 213 CHEMISTRY OF AMINO ACIDS AND PROTEINS (2 UNITS)

Structure, properties and classification of amino acids, pH, pka and buffer, peptide. Reactions of specific amino acids, separation of sequence of peptides, chemistry of proteins including their structural level and types of bonds stabilizing them, properties, functions and classifications of proteins, enzymes, vitamins and co-enzymes

BIO 216 CHEMISTRY OF CARBOHYDRATES, LIPIDS AND NUCLEIC ACIDS (2 UNITS)

Classification of physical properties of carbohydrates, structure of glucose, projection and perspective formular, structure of properties of other monossacharides, brief treatment of dissacharides and polyssacharides. Chemistry, classification and properties of lipids. Methods of analysis of lipids, lipoprotein, membrane and membrane structure. Chemistry of nucleic acids (Bases, Sugar and Phosphate acid). Structure and roles of RNA and DNA

CHM 201: PHYSICAL CHEMISTRY II (2 UNITS)

Kinetic theory of gases, behaviour of real gases; The laws of thermodynamic Entropy and free energy, reactions and phrase equilibrium; reaction rate laws for gases where the concentration of the reactions are the same. Mechanism and theories of unimolecular reactions.

CHM 202: ANALYTICAL CHEMISTRY I (2 UNITS)

Theory of errors, statistical treatment of data; Theory of sampling, chemical methods of analysis including volumetric (acid base,, oxidation – reduction, precipitation and complexiметry); Physicochemical methods

(Optical methods of analysis – UV/V), separation methods. pH notation and buffer solutions. Gravimetry solubility product and its application to separation methods of metals.

CHM 203: ORGANIC CHEMISTRY II (2 UNITS)

Factors affecting structure and physical properties of organic compounds; Factors affecting availability of electrons, Stereo-chemistry; Energy of activation and free radical substitution reactions in alkenes. Functional group chemistry. Electrophillic and nucleophillic substitution reactions. Aromaticity. Various type of organic reactions; e.g. addition, free radical, elimination and substitution reactions.

CHM 204: STRUCTURE AND BONDING (2 UNITS)

Idea of quantum states. Orbitals, shape and energy, simple valence theory. Electron repulsion theory; atomic spectra. The structure and chemistry of some representative main group element compounds.

CHM 205: INORGANIC CHEMISTRY II (2 UNITS)

Chemistry of first row transition metals. Introduction to co-ordination Chemistry including elementary treatment of crystal field theory. Comparative Chemistry of the following elements: Ga, In, TI, (b) Ge, Sn, Pb, (c) As, Sb, Bi (d) Se, Te, Po. Elementary introduction to Organometalic Chemistry. Role of metals in biochemical Systems

CHM 291: PRACTICAL CHEMISTRY III – INORGANIC CHEMISTRY (1 UNITS)

Inorganic chemistry practical based on CHM 205

CHM 292: PRACTICAL CHEMISTRY IV – ORGANIC AND PHYSICAL CHEMISTRY (1 UNITS)

Organic and physical chemistry practical based on CHM 201 and CHM 203.

MTH 212: LINEAR ALGEBRA II (2 UNITS)

Vector spaces. Liner independence. Basis, change of basis and dimension. Linear equations and matrices. Linear maps. The diagonal, permutation, triangular matrices. Elementary matrix. The inverse of a matrix. Rank and nullity. Determinants. Adjoint, cofactors, inverse matric. Determinantial rank. Crammer's rule. Canonical forms, similar matrics, Eigen values and vectors, quadratic forms.

MTH 281: MATHEMATICAL METHODS 1: (2 Units)

Real-valued functions of a real variable. Review of differentiation and integration and their applications. Mean value theorem. Taylor series. Real-valued functions of two or three variables. Partial derivatives chain rule, extrema, languages multipliers. Increments, differentials and linear approximations. Evaluation of line, integrals. Multiple integrals.

PHY 202: MODERN PHYSICS I (2 UNITS)

Atomic structure, Charge quantisation, Mass spectra, the plum pudding model, Rutherford model and Bohr models of the atom, Hydrogen spectra, Magnetic moment and Angular momentum of an atom, Electron spin, Pauli exclusion principle and electronic configuration, X-ray spectra, Wave-particle duality, Nuclear structure: nomenclature, binding energy and stability, Radioactivity, The radioactive series, Accelerators, Detectors.

PHY 204: ELECTROMAGNETISM (2 UNITS)

Macroscopic properties of dielectrics: polarisation, Gauss's law in a dielectric, the displacement vector, boundary conditions on D and E, dielectric strength and breakdown; Capacitor: capacitance, the parallel plate capacitor, effect of a dielectric, energy stored in a dielectric medium, capacitors in series and parallel, practical capacitors; Microscopic properties of dielectrics: microscopic picture of a dielectric in a uniform electric field, determination of local field, Clausius-Mossotti equation, behaviour of dielectric in alternating fields; Magnetism of materials: response of various substances to a magnetic field, magnetic moment and angular momentum of an atom, diamagnetism and paramagnetism, Lamor precession, magnetisation of paramagnets, ferromagnetism, magnetic field due to a magnetised material, magnetic intensity, relationship between E and H for magnetic material, magnetic circuits.

300 LEVEL

GST 301: ENTREPRENEUR STUDIES 1 (0 Units)
Introduction to entrepreneurship and new venture creation; Entrepreneurship in theory and practice; The opportunity, Forms of business, Staffing, Marketing and the new venture; Determining capital requirements, Raising capital; Financial planning and management; Starting a new business, Feasibility studies; Innovation; Legal Issues; Insurance and environmental considerations. Possible business opportunities in Nigeria.k, nails, screws making Dyeing/Textile blocks paste making.

CHM 301: PHYSICAL CHEMISTRY III (3 UNITS)
Introduction to key thermodynamic functions and applications. First, second and third laws of thermodynamics, internal energy of a system: the carnot heat engine; The concept of entropy and the criteria for spontaneity and equilibrium for physical and social processes including single and multiple comparism system. The concept of reversibility and irreversibility, free energy derivations, Maxwell relations, Gibbs functions. Equilibrium thermodynamic as (ideal solutions and vapour, fugacity concepts). Properties of electrolytes (colligate properties and phrase rule. Introduction to statistical thermodynamics

CHM 302: POLYMER CHEMISTRY I (2 UNITS)
The nature of Polymer nomenclature. Outline of sources of raw materials for polymers; Polymerization process, condensation polymerization in details. Solubility and solution properties of polymers. Structures and properties of polymers. Fibre forming polymers.

CHM 303: INORGANIC CHEMISTRY III (3 UNITS)
The noble gases. Hydrogen, electronic structure and general properties and comparative study of Group IA Group IIA elements. Chemistry of Boron: Carbon and Silicon, nitrogen and phosphorous, oxygen and sulphur. The halogens, and transition element, separation of metals. Coordination chemistry, Ligand and crystal field theories, Introduction to radio chemistry , radio activity and the periodic table.

CHM 304: COLOUR CHEMISTRY AND TECHNOLOGY (2 UNITS)
Colour and constitution. Chemistry, properties of dyes and pigments. Classification of dyes and fibres. Dyeing mechanisms. Preparation and dyeing of natural and synthetic fibres.

CHM 305: ORGANIC CHEMISTRY III (3 UNITS)
Alcohols and their reactions. Ethers and Epoxides. Carboxylic acids and their derivatives. Aldehydes and ketones. Carbanion, α and β – unsaturated compounds. Polyfunctional compounds . Heterocyclic chemistry. Stereochemistry; Chirality, enantomers, E and Z. cis and trans, conformations

CHM 306: INSTRUMENTAL METHODS OF ANALYSIS (2 UNITS)
Spectroscopic techniques, physicochemical optical; flame and X-ray methods. Fluorence method, magnetic resourance and electron spin resonance. Referchemistry and interferometry . florerimentry, polarography , calorimetry.

CHM 307: ATOMIC AND MOLECULAR STRUCTURE & SYMMETRY (3 UNITS)
Schrödinger equation. Helium atom, ground and excited states, spin and Pauli principles, hydrogen molecule, comparison of molecutar orbital and Valence bond theories; concepts of resonance and configuration of orbital for historic molecular, walsh rules. Rotational and vibrational bond length and angles. Brief mention of other methods, atomic spectra, Russell Sounder's coupling, orbital and spin angular momentum. Use of symmetry in chemistry. Heat capacities of solids. Theory of bonding in H 2 + and H 2 . Rotation and vibration of molecules. Heat capacities of crystals

CHM 309: ORGANIC SPECTROSCOPY (2 UNITS)
Principles and applications of UV, IR, NMR and Mass spectroscopy the determination and elucidation of structure of organic compounds.

CHM 311: PETROLEUM CHEMISTRY (2 UNITS)
Petroleum in the contemporary energy scene: Nature, classification and composition of crude petroleum and natural gases. Distribution of petroleum and natural gas resources (the global and Nigerian situations). Petroleum technology, survey of refinery products and process. Petrochemicals as industrials raw materials. Prospects for the petrochemical industry in Nigeria and LNG

CHM 312: INDUSTRIAL CHEMICAL PROCESSES I (2 UNITS)

Production of primary intermediates and synthesis of industrial organic chemicals; Polymers, adhesives, dyes, explosives, insecticides, pesticides, herbicides, flavouring agents and pharmaceutical. Fermentation process.

CHM 314: ENVIRONMENTAL CHEMISTRY (2 UNITS)
Concepts of elementary cycles. Characteristics of the atmosphere. Sources, types and effects of environmental pollution. Waste water treatment. Composition of domestic wastes. Water chemistry and analysis. Chemical and Physical instrumentation in environmental sciences.

CHM 315: CARBOHYDRATE CHEMISTRY (2 UNITS)
Classification, structure and nomenclature of carbohydrates. Sugars, general reaction; preparations and reaction mechanisms. Configurations. Epimerisation.

CHM 316: INDUSTRIAL CHEMICAL TECHNOLOGY I (2 UNITS)
Heat transfer and Mass transfer processes. Unit operations. Chemical technology equipment.

CHM 318 : NATURAL PRODUCTS CHEMISTRY I (2 UNITS)
Terpenoids, carotenoids, steroids, alkaloids and lipids

CHM 391: PRACTICAL CHEMISTRY V -INORG AND ANALYTICAL (1 UNITS)
Inorganic and analytical chemistry practical, based on CHM 303 and CHM 202

400 LEVEL

CHM 406: NUCLEAR AND RADIOCHEMISTRY (2 UNITS)
Natural radioactivity, fusion, fission, decay process, nature of radiation. Nuclear models, energetic of nuclear reaction. Principles and measurement of radioactivity. Applications of radioactivity. Radiation Hazards.

CHM 407: REACTION KINETICS (3 UNITS)
Review of first, second and third order rate equations. Rate constants, and equilibrium constant collision theory, transition state theory, reaction coordinates. Unimolecular reaction theory, Bimolecular reaction mechanism: Chain reaction mechanisms; catalysis and heterogeneous reactions. Photochemical reactions mechanism.

CHM 408: POLYMER CHEMISTRY II (2 UNITS)
Polymerization mechanisms; detailed treatment of addition polymerization. Stereospecific polymerization. Copolymensation. Phase systems for polymerization. Industrially important thermoplastic and thermosetting polymers: Polyurethanes. Rubber elasticity. Mechanical properties of polymers. Analysis and testing of polymers. Degradation of polymers.

CHM 409: ELECTROCHEMISTRY (2 UNITS)
Electrical double layer, potential at Zero charge; Polarisable and non polarisable interphase; mass transport, concentration polarisation, fials lars, levic equation , polarography, electronics.

CHM 411: PROJECT (6 UNITS)

A laboratory research project in any area of chemistry

CHM 413: ANALYTICAL CHEMISTRY II (2 UNITS)
Theory of error-significance round correlation tests. Potentiometer and pH titrations. Conductometric methods, electrolytic methods, radiochemical methods. Chromatography Calorimetry.

CHM 414: PHOTOCHEMISTRY AND PERICYCLIC REACTIONS (2 UNITS)
Interaction of radiation with matter, electronic excitation, selection rules, deactivation routes, sensitization, quenching, photo fragmentation, oxidation, reduction, rearrangement, pericyclic reactions and molecular orbital symmetry

CHM 416: ORGANIC SYNTHESIS (2 UNITS)
Critical view of important reactions, reagents and methods including the mechanisms. Application of synthesis of important and complex organic compounds.

CHM 421: HETEROCYCLIC CHEMISTRY (2 UNITS)
The Synthetic and mechanistic aspects of fused heterocyclic system-particularly Quinolines, Iso-quinolines, Benzofurans, Benzothiophenes, Indoles, Genzopyrylium salts, Coumarius and Chromones. Application of heterocyclic systems in drug synthesis.

CHM 422: NATURAL PRODUCTS CHEMISTRY II (2 UNITS)
Chemistry of terpenoids, steroids, and alkaloids, antibiotics, flavonoids. Prostaglandins and chlorophylls. Other natural products of pharmaceutical Importance. General methods of Isolation, separation, purification and structural determination of the natural products. Classifications. Discussion of chemistry of important members; Biogenesis.

CHM 423: COORDINATION CHEMISTRY (3 UNITS)
Definition, Recognition and Applications of Coordination compounds. Nomenclature, Coordination formula and Isomerism in complexes. Stereochemistry of complex molecules; Theories of structures and bonding. Physical methods of structural investigation. Magnetic properties. Absorption and Vibrational spectra. The spectrochemical series. The Nephelauxetic series and the Jahn-Teller distortions. Stabilization of unusual oxidation states by complex formation. Thermodynamic stability of complex compounds, the stability constant, the chelate effect. Preparation and reactions complexes. Kinetics and Mechanisms.

4.10.2 Minimum course credits for graduation:

Minimum of 120 credit units for a 4-year B.Sc (Chemistry) programme; and 90 units for a 3-year B.Sc (Chemistry) programme, excluding the GST courses.

4.10.3 General Studies Courses (GST):

They are university compulsory courses that must be offered and passed before graduation.

Table 1. Compulsory General courses for Programmes in the Faculty of Sciences: BIO 101, BIO 191, BIO 102, BIO 192, CHM 101, CHM103, CHM 191, CHM 102, CHM 192, CIT 101, CIT 102, CIT 143, MTH 101, MTH 102, MTH 103, PHY 101, PHY 102, PHY 191,PHY 192, STT 102

4.10.4 Degree award requirements (examples):

Table : BSc. CHEMISTRY: To graduate, a student shall have undergone at least 6-8 semesters of study depending on entry point, including field practical training. Students are to pass a minimum of 128 credit units for a 4-year B.Sc (Chemistry) programme; and 98 units for a 3-year B.Sc (Chemistry) programme, excluding the GST courses. The submission of an undergraduate project thesis based on a supervised research is a graduation requirement which cannot be compromised.

4.11 GRADE POINT AVERAGE (GPA) AND CUMULATIVE GRADE POINT AVERAGE (CGPA)

4.11.1 Formula for calculation of GPA and CGPA: CGPA = CGPE/TCC

CGPE is cumulative grade point earned

TCC is total credit carried

GPA = TPA/TCC

4.12 CLASS OF DEGREE : Graduating class limits are as follows;

First class: 4.5 -5.0

Second class upper division: 3.5 – 4.49

Second class lower division: 2.49 – 3.49

Third class: 1.4 – 2.48

4.13 GOOD ACADEMIC STANDING: 1.50 and above

4.14 END OF PROGRAMME CLEARANCE: Students to obtain clearance document from the study centre.

Clearance with:

1. The library

2. Bursary

3. ICT (e- wallet print out)

4. ID card

PART 5: ASSESSEMENT AND EVALUATION

B.SC. PHYSICS PROGRAMME

PROGRAMME AND DEGREE AWARD REQUIREMENTS

Programme Title: B.Sc. Physics

Programme Code: (5214)

LIST OF ACADEMIC STAFF

S/N	NAME	SEX	DESIGNATION	ID NO.	E-MAIL	TEL. NO
1	Dr. Funmilayo Laosebikan AYEDUN	F	Lecturer I	B.Sc. M.Sc.. PhD.	funmiayedun@yahoo.com	08072960424
2	Mr. Effiong IBANGA	M	Assistant Lecturer	B.Sc. M.Sc.	efiongibanga@yahoo.com , eibanga@noun.edu.ng	08167306652

Additional (Adjunct) Academic staff

See list of Facilitators at http://facilitators.nounacademics.net/facilitators

b. Philosophy, Aims and Objectives of the Degree Programme

PHILOSOPHY

Programme seeks to promote the science of Physics by developing graduates who would acquire knowledge and skill through hands-on experience and supporting use of technologies such as virtual and dry laboratories, as well as other ODL infrastructure to ensure no barrier to learning and access.

AIMS AND OBJECTIVES

- ✓ To produce competent graduates of physics with sound knowledge and skills to contribute to the rapid technological growth of the Nigerian society and the word at large.

- ✓ To produce competent graduates who will seek to advance and exploit entrepreneurial opportunities in the field of Physics.

- ✓ To produce graduates who will utilize their Physics knowledge, skills and abilities to enhance safety, health and welfare of the public through the simulation, construction and maintenance of industrial equipment.
- ✓ To produce graduates that will satisfy that manpower needs of our society in sectors of energy, industry, communication, science, engineering and research.

c. Admission and Graduation Requirements

Admission Requirements

To be admitted into the B.Sc. Physics programme, a candidate is expected to possess at least one of the following:

i) Five (5) credit passes in Senior School Certificate Examination (SSCE) or at the School Certificate (SC), General Certificate of Education (GCE) Ordinary Level, National Examinations Council (NECO) or 6 merit passes in National Board for Technical Education (NABTEB) or Teachers Grade Two Certificate (TC II) examinations. The credit passes must include Mathematics and Physics. Credit pass in English language is required.

ii) General Certificate of Education (GCE) Advanced level in Mathematics and Physics for entry into 200 level of the programme.

iii) National Certificate in Education (NCE) with merit passes in Mathematics and Physics or Physics and Chemistry for entry into 200 level of the programme.

iv) National Diploma (N.D.) in the physical sciences or equivalent qualification from an institution recognized by Senate for entry into 200 level of the programme.

v) Degree or Higher National Diploma (HND) or equivalent qualification in any physical science from an institution recognized by Senate for entry into 200 level of the programme.

Note: All direct entry candidates must satisfy the ordinary level requirement.

Graduation Requirements

To graduate, a student shall have undergone at least 6-8 semesters of study depending on entry point, including field practical training. Course work load must meet the graduation requirements of the University based on minimum academic standards. However, in doing so, the student must earn minimum of128 credit units for the four year programme and 98 credit units for the three years (Direct entry) programme. The submission of an undergraduate project thesis based on a supervised research is a graduation requirement which cannot be compromised.

a. OUTLINE PROGRAMME PROPOSAL (OPP)

BSc. Physics

100 Levels

1st Semester

Course Code	Course Title	Unit(s)	Status
BIO101	General Biology I	2	C
BIO191	General Biology Practical I	1	C
CHM101	Introductory Inorganic Chemistry	2	C
CHM103	Introductory Physical Chemistry	2	C
CHM191	Introductory Practical Chemistry I	1	C
CIT 101	Computer in Society	2	C
GST 101	Use of English and Communication Skills	0	C
GST 107	The Good Study Guide	0	C
MTH101	General Mathematics I	3	C
PHY 101	Elementary Mechanics, Heat and Properties of Matter	3	C
PHY 103	Geometric and Wave Optics	2	C
PHY 191	Introductory Practical Physics I	1	C
	Total Credit Units (Compulsory)	**19**	

2nd Semester

Course Code	Course Title	Unit(s)	Status
BIO102	General Biology II	2	C
BIO192	Introductory Practical Biology II	1	C
CIT 102	Software Application Skills	2	C

CHM102	Introductory Organic Chemistry	2	C
CHM192	Introductory Practical Chemistry II	1	C
GST 102	Use of English and Communication Skills II	0	C
MTH102	General Mathematical II	2	C
PHY102	Electricity, Magnetism and Modern Physics	3	C
PHY192	Introductory Physics Laboratory II	1	C
	Total Credit Units (Compulsory)	**14**	

200 Level

1st Semester

Course Code	**Course Title**	**Unit(s)**	**Status**
CIT 215	Introductory Programming Language	3	C
GST 201	Nigerian Peoples and Culture	0	C
GST203	Introduction to Philosophy & Logic	0	C
MTH 281	Mathematical Method I	3	C
PHY 201	Classical Mechanics I	3	C
PHY 203	Oscillations and Waves	2	C
PHY 205	Introduction to Space Physics	2	E
PHY 207	Thermodynamics	2	C
PHY 261	Geophysics I	2	C
PHY 291	Physics Laboratory I	1	C
STT 211	Probability Distribution I	3	C
	Total Credit Unit (Compulsory)	**19**	

2nd Semester

Course Code	Course Title	Unit(s)	Status
MTH 210	Introduction to Complex Analysis	3	E
MTH212	Linear Algebra II	3	C
MTH 232	Elementary Differential Equations I	3	C
MTH282	Mathematical Method II	3	E
PHY 202	Modern Physics I	2	C
PHY 204	Electrodynamic I	2	C
PHY 206	Optics I	2	C
PHY 208	Network Analysis and Devices	3	C
	Total Credit Units	**21**	

Students are to choose only one elective course

300 Level

1st Semester

Course Code	Course Title	Unit(s)	Status
GST301	Entrepreneurial Studies I	0	C
MTH303	Vector and Tensor Analysis	3	C
PHY301	Classical Mechanics II	3	C
PHY303	Special Relativity	2	C
PHY305	Energy	2	E
PHY307	Solid State Physics I	2	C
PHY309	Quantum Mechanics I	3	C
PHY310	Electronics II	2	C

PHY311	Kinetic Theory and Statistical Mechanics	2	C
PHY313	Mathematical Methods for Physics I	3	C
PHY361	Geophysics II	2	E
PHY351	Optoelectronics	2	E
PHY 391	Physics Laboratory II	1	C
	Total Credit Unit	**27**	

Students are to choose only one elective course

2nd Semester

Course Code	**Course Title**	**Unit(s)**	**Status**
PHY 302	Modern Physics II	2	E
PHY304	Electrodynamics I	2	E
PHY 306	Optics II	2	C
PHY308	Electronics I	2	C
PHY 314	Numerical Computations	2	C
PHY362	Workshop Practice	2	C
PHY399	SIWESS	6	C
	Total Credit Units (Compulsory)	**14**	

400 Level

1st Semester

Course Code	**Course Title**	**Unit(s)**	**Status**
PHY401	Elementary Particle Physics	3	C

PHY 405	Electronics III	3	C
PHY 407	Solid State Physics II	3	C
PHY 409	Quantum Mechanics II	3	E
PHY413	Mathematical Methods for Physics II	3	C
PHY 451	Ionospheric Physics	3	E
PHY 453	Plasma Physics	3	E
PHY 455	Lower Atmospheric Physics	3	E
PHY457	Environmental Physics	3	E
PHY 461	Geophysics III	3	E
PHY499	Project	6	C
	Total Credit Units (Compulsory)	**18**	

Students are to take one elective course only

2nd Semester

Course Code	**Course Title**	**Unit(s)**	**Status**
PHY 402	Nuclear Physics	3	C
PHY404	Electrodynamics I	3	C
PHY406	Optics III	3	C
PHY 408	Electronics IV	3	E
PHY492	Laboratory Physics III	3	C
PHY 452	X-ray Crystallography	3	E

PHY 454	Astrophysics	3	E
PHY 456	Nuclear Reactor Physics	3	E
	Total Credit Units (Compulsory)	**12**	

Students are to take one elective course only.

BIO101 GENERAL BIOLOGY I (2 UNITS)

General characteristics, similarities, differences, distribution and economic importance of virus, Bacteria, fungi, lower green vascular plants. Ecological adaptation of various plant forms. Interrelationship of plants evolution and reproduction

BIO102 GENERAL BIOLOGY II (2 UNITS)

Systematic studies of diversity of life including monera, protista, plants (Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and angiosperms) and animals (Protozoa, Platyhelminthes, Annelids, Arthropods, Fishes, Amphibians, Reptiles, Birds and Mammals) based on similarities and differences in external morphology. Taxonomic divisions of plant and animal kingdoms. Ecological adaptations of these forms.

BIO 191 GENERAL BIOLOGY PRACTICAL I (1 UNIT)

What practical work in biology involves. Laboratory organization. Handling common laboratory equipment. Microscopic handling and maintenance. Making microscopic measurements. Procuring animal materials for practicals. Killing, preserving and maintaining animal materials. Procuring plant materials. External features of plants (differences and similarities). Preparation of temporary slides. Preparation of stains and reagents. Techniques for microbial culture and grain staining. Setting up demonstration for physiological processes in plants. Setting up apparatus for demonstrating physiological processes in animals. Preparation required for dissection.

BIO 192 GENERAL BIOLOGY LABORATORY II (1 UNIT)

Observation and description of the morphological and diagnostic features as well as the differences among the different phyla of the plant, animal, archebacteria, eubacteria, fungi and protista kingdoms. Identification of the taxonomic hierarchy of the members of the above groups. Study of the structure and functions of their parts and habitats specifications

CHM101: INTRODUCTORY INORGANIC CHEMISTRY (2 UNITS)

Hypothesis, theory and law with appropriate illustrations, Nature of matter – 3 states of matter, Atomic structure, electronic energy levels and orbital. Periodic classification of elements and its relationship to their electronic configurations, Chemical bonding, Survey of properties and trends in groups I, II, IV, VI and transition metal,

CHM 102: INTRODUCTORY ORGANIC CHEMISTRY (2 UNITS)

Simple reactions of hydrocarbons, alcohols, and acids. Petroleum chemistry, Oils and fats, hydrogenation of oils, polymer and biologically important molecule.

CHM103: INTRODUCTORY PHYSICAL CHEMISTRY (2 UNITS)

Mole concepts and calculations based on it, methods of expressing concentrations, Chemical Kinetics and equilibrium, and related calculations, Important application of equilibrium – pH, solubility products and solubility of ionic solids, Thermo chemistry and simple calculations based on Hess's law, Electrochemistry and working of various cells, Brief mentions of corrosion; chemical thermodynamics; $\Delta G = \Delta H - T\Delta S$

CHM 191: INTRODUCTORY PRACTICAL CHEMISTRY I (1 UNIT)

Practical based of CHM 101 and CHM 103: Cations and anions – identification, Acid- base titrations, Redox reactions and determinations

CHM 192: INTRODUCTORY PRACTICAL CHEMISTRY II (1 UNIT)

Practical based on general chemistry CHM 101 and introductory organic chemistry I CHM 102- Determination of melting and boiling points and reaction of functional groups.

CIT101: COMPUTERS IN SOCIETY (2 UNITS)

Introduction to Basic concepts of the Computer System; A survey of various uses of the Computer; Computer applications in the Modern Society; Effects of Computerization of the Workplace; Computer Ethnics and Security Issues, Classical examples of the effects of the internet on the society.

CIT102: APPLICATION SOFTWARE SKILLS (2 UNITS)

Brief description of computer system: CPU, I/O devices; Operating systems; Computer File Management; Computer Software: overview, types, etc.; Application software: common application software; Using Microsoft Word; Using Microsoft Excel; Features of Database Applications and Microsoft Access; Statistical Analysis Applications; Using SPSS software; Introduction to Desktop Publishing applications; Computer applications in Nursing; Computer applications in Agriculture; Managing the computer system with the Control Panel. Protection.

GST101: USE OF ENGLISH AND COMMUNICATION SKILLS I (0 UNIT)

Listening enabling skills, listening and comprehending comprehension, note taking and information retrieval. Including data, figures, diagrams and charts. Listening for main idea, interpretation and critical evaluation. Effective reading. skimming and scanning. Reading and comprehension at various speed levels. Vocabulary development in various academic contexts. Reading diverse texts in narratives and expository. Reading and comprehension passages with tables, scientific texts. Reading for interpretation and critical evaluation.

GST102: USE OF ENGLISH AND COMMUNICATION SKILLS II (0 UNIT)

Writing paragraphs: Topic sentence and coherence. Development of paragraphs: illustration, Description, cause and effect including definitions. Formal letters; essential parts and stylistic forms, complaints and requests; jobs, ordering goods, letters to government and other organizations. Writing reports; reporting event, experiments. Writing summaries: techniques of summarizing letters and sounds in English, vowels and consonants. Interviews, seminar presentation, public speech making, articles, concord and sentences including tenses. Gerund, participles, active, passive and the infinitive. Modal auxiliaries.

GST107: THE GOOD STUDY GUIDE. (0 UNIT)

Getting started: How to use the book, why read about skills, getting yourself organised ; what is studying all about, reading and note taking; Introduction, reactions to reading, your reading strategy, memory, taking notes, conclusion. Other ways of studying: Introduction, learning in groups, talks and lectures, learning from TV and radio broadcasts, other study media. Working with numbers; Getting to know numbers, describing the world, describing with the tables, describing with diagrams and graphs; What is good writing? The Importance of writing, what does an essay look like, what is a good essay? Conclusion. How to write essays: Introduction, the craft of writing, the advantages of treating essay writing as a craft, making your essay flow, making a convincing case, the experience of writing. Preparing for examination.

MTH101 GENERAL MATHEMATIC I: (3 Units) (ALGEBRA AND TRIGONOMETRY)
Elementary set theory, subsets, union, intersection, complements, Venn diagrams; Real numbers; integers, rational and irrational numbers, mathematic I, induction real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; Algebra of complex numbers; the Argand Diagram; Re Moivre's theorem; nth roots of unity. Circular measure; trigonometric functions of angles of any magnitude, addition and factor formulae

MTH102 GENERAL MATHEMATICS II: (3 Units)

Calculus: Function of a real variable, graphs, limits and idea of continuity. The derivative as limit of rate of change; Techniques of differentiation; Extreme curve sketching; Integration as an inverse of differentiation; Methods of integration, Definite integrals; Application to areas, volumes.

PHY101: Elementary Mechanics, Heat and Properties of Matter (3 UNITS)

Space and Time: Physical quantities: Units and dimensions of physical quantities; Kinematics: Uniform velocity motion, uniformly accelerated motion; Dynamics: Newton's laws of motion; Impulse and Linear Momentum, Linear Collision, Newton's universal law of gravitation; Work, energy and power; Conservation laws; Concept of mechanical equilibrium; Centre of mass and centre of gravity; Moment of a force; Rotational kinematics and dynamics: Torque; Moment of Inertia; angular momentum; Total mechanical energy. Simple harmonic motion

Heat and temperature, work and heat, Quantity of heat: heat capacities, latent heat; Thermal expansion of solids, liquids and gases; Gas laws, heat transfer; Laws of thermodynamics: Isothermal and Adiabatic changes, Carnot cycle; Application kinetic theory of gases; van der Waals gas.

Classification of matter into (solids, liquids and gases, forces between atoms and molecules, molecular theory of matter, Elasticity, plasticity, Hook's Law, Young's Shear and bulk Moduli) Crystalline and non-crystalline materials, Hydrostatics: pressure, buoyancy, Archimedes' principle; Hydro-dynamics-streamlines, Bernouli and Continuity equations, turbulence, Reynold's number, Viscosity, laminar flow, Poiseuille's equation; Surface tension, adhesion, cohesion, capillary, drops and bubbles.

PHY102: ELECTRICITY, MAGNETISM AND MODERN PHYSICS (2 UNITS)

Electrostatics: Coulomb's law, Gauss's law, potential and capacitance, dielectrics, production and measurement of static electricity. Current: Ohm's law, resistance and resistivity, heating. Galvanometers, Voltmeters and Ammeters; D.C. circuits: sources of emf and currents, Kirchhoff's laws; Electrochemistry; The Earth's magnetic field; Magnetic fields and induction, Faraday's and Lenz's laws; Force on a current-carrying conductor. Biot-Savart law. Flemming's right and left-hand rules, motors and generators. A.C. Theory. Atomic structure; Production and properties of X-rays; Radioactivity; Photoelectric emission.

PHY103: GEOMETRIC AND WAVE OPTICS (2 UNITS)

Geometrical Optics: law of reflection and refraction; Location of images: Plane and curved mirrors; Converging and diverging thin lenses; Thick lenses; Lens defects; Aberrations; The eye; Optical instruments. Simple Harmonic motion; Wave motion and wave types; Dispersion; Production of sound in strings and pipes resonance, applications; Simple description of diffraction and interference, applications to both light and sound waves; Polarization of transverse waves.

PHY191: INTRODUCTORY PHYSICS LABORRATORY I (1 UNIT)

Graphs, Measurement, Error Analysis, Determination of Acceleration due to Gravity by Means of Simple Pendulum, Determination of force constant of a spiral spring, Determination of effective mass of a spiral spring and the constant, Determination of surface tension of water, Determination of specific latent heat of fusion of ice, Determination of the co-efficient of limiting static friction between two surfaces, Determination of the co-efficient of static friction on two surfaces using an inclined plane, Determination of Relative Density of kerosene using the specific Gravity Bottle,

PHY192: INTRODUCTORY PRACTICAL PHYSICS II (1 UNIT)

Refraction through the glass block; Image formed by a concave mirror; Determination of the focal length of the convex mirror; Refraction through the triangular prism; Determination of the focal length of a converging lens and the refractive index of groundnut; Determination of resistance of resistors in series and in parallel in simple circuits; Determination of internal resistance of a dry cell using a potentiometer; To compare the E.M.F. of cells using potentiometer; Determine the unknown resistance of a resistor using Wheatstone Bridge; To determine the relationship between current through a Tungsten and a potential applied across it.

CIT215: INTRODUCTION TO PROGRAMMING LANGUAGES (3 UNITS)

FORTRAN programming language; Comparison of various versions of the language. Programming exercises using FORTRAN with emphasis on scientific application problems. Elements of Pascal language. Exercises in Pascal Programme structures and programming concepts; Structured design principles; abstraction, modularity, stepwise refinement, structured design techniques teaching of a structured programming language, e.g. PASCA/JAVA, C^{++}.

GST201 NIGERIAN PEOPLES AND CULTURE (0 UNIT)

Nigerian history, culture and arts in pre-colonial times; Nigerians' perception of their world; culture areas of Nigeria and their characteristics; evolution of Nigeria as a political unit; indigene/settler phenomenon; concepts of trade; economic self- reliance; social justice; individual and national development; norms and values; negative attitudes and conducts (cultism and related vices); re-orientation of moral and national values; moral obligations of citizens; environmental problems.

GST203: INTRODUCTION TO PHILOSOPHY AND LOGIC (0 UNIT)

General introduction to logic; clarity of thought; expression and arguments as basis for conclusion. Fundamentals of logic and critical thinking, types of discourse, nature of arguments; validity and soundness ; distinction between inductive and deductive inferences etc; illustrations from familiar texts, including literature materials, novels, law reports and newspaper publications.

MTH210 : INTRODUCTION TO COMPLEX ANALYSIS (3 UNITS)

Complex number, the topology of complex plane. Limits and continuity of function of complex variables, properties and example of analytic functions, branch-points, Cauchy-Riemann equations. Harmonic function.

MTH211: INTRODUCTION TO SET THEORY AND ABSTRACT ALGEBRA (2 UNITS)

Set: Binary operations, mapping, equivalence relations integers: Fundamental theorem of arithmetic, congruence equations, Euler's function (n) Group Theory: Definition and examples of groups. Subgroups, coset decomposition, Lagrange's theorem. Cyclic groups. Homeomorphisms, isomorphism. Odd and even permutations. Cayley's theorem. Rings: Definition and examples of rings. Commutative rings. Integral domain. Order, well-ordering principles. Mathematical induction.

MTH212: LINEAR ALGEBRA II (3 UINTS)

Vector spaces; Liner independence. Basis, change of basis and dimension; Linear equations and matrices. ; Linear maps. The diagonal; permutation; triangular matrices. Elementary matri;. The inverse of a matrix; Rank and nullity. Determinants; Adjoint, cofactors, inverse matric. Determinantial rank. Crammer's rule. Canonical forms, similar matrices, Eigen values and vectors, quadratic forms.

MTH232: ELEMENTARY DIFFERENTIAL EQUATION I (3 UNITS)

Introduction; equation of first order and first degree, separable equations, homogeneous equations, exact equations, linear equations, Bernoulli's and Riccati equations. Applications to mechanics and electricity; Orthogonal and oblique trajectories. Second order equations with constant coefficients.

MTH281 MATHEMATICAL METHOD I (3 UNITS)

Sequences and Series; Limits, Continuity, Differentiability, Implicit Functions, Sequences, Series, Test For Convergence Sequences And Series Of Functions .Calculus, Partial Differentiation, Total Derivatives, Implicitly Function, Change Of Variable, Talyor's Theorem And Maxima And Minimum Functions Of Two Variables, Lagrangian Multiplier. Numerical Methods; Introduction to Iterative Methods, Newton's Method Applied To Finding Roots. Trapezium and Simpson's Rules of Integration.

PHY201: CLASSICAL MECHANICS I (3 UNITS)

Vector Analysis; Review of coordinate transformations; Particle kinematics and dynamics, Many particle systems; Central force: Motion in a central force field; Central-conservative forces; Kinematics in polar coordinates; Energy conservation in central-conservative force-field; Planetary Motion; Keplerian case; Rigid body dynamics. Newtonian gravitation; Conservatives and potentials; Defects of Newtonian mechanics and the essence of special relativity.

PHY202: MODERN PHYSICS I (3 UNITS)

Atomic structure: Experimental basis of quantum theory: Black body radiation; electrons and quanta; Charge quantization, Mass spectra, the plum pudding model, Rutherford model and Bohr models of the atom, Hydrogen spectra, Magnetic moment and Angular momentum of an atom, Electron spin, Pauli Exclusion Principle and electronic configuration, X-ray spectra, De Broglie hypothesis, the uncertainty principle; Wave-particle duality, Schrodinger's equation and simple applications; Nuclear Structure: nomenclature, binding energy and stability, Radioactivity, The radioactive series, Accelerators, Detectors. Bohr's theory of atomic structure;

PHY203: OSCILLATIONS AND WAVES (2 UNITS)

Simple harmonic motion, Superposition of simple harmonic oscillations, Damped harmonic motion, Forced oscillations and resonance, Coupled oscillations, Wave motion, Waves at the boundary of two media, Superposition of waves.

PHY204: ELECTROMAGNETISM (2 UNITS)

Macroscopic properties of dielectrics: polarisation, Gauss's law in a dielectric, the displacement vector, boundary conditions on **D** and **E**, dielectric strength and breakdown; Capacitor: capacitance, the parallel plate capacitor, effect of a dielectric, energy stored in a dielectric medium, capacitors in series and parallel, practical capacitors; Microscopic properties of dielectrics: microscopic picture of a dielectric in a uniform electric field, determination of local field, Clausius-Mossotti equation, behaviour of dielectric in alternating fields; Magnetism of materials: response of various substances to a magnetic field, magnetic moment and angular momentum of an atom, diamagnetism and paramagnetism, Lamor precession, magnetization of paramagnets, ferromagnetism, magnetic field due to a magnetized material, magnetic intensity, relationship between **E** and **H** for magnetic material, magnetic circuits.

PHY205 INTRODUCTION FOR SPACE PHYSICS (2 Units)

Introduction to Astronomy and Astrophysics, Satellite Communication, introduction to atmospheric Science, Space Environment, Space craft systems and Dynamics, Aero/Astrodynamic Engineering, Rocket Engineering, Cosmology, Origin of universe and life, Space Law and Business development.

PHY206: OPTICS I (2 UNITS)

Nature of light: the corpuscular model, the wave model, light as an electromagnetic wave; Reflection and refraction of light: electromagnetic waves at the interface separating two media, idealization of waves as light rays, Fermat's principle; Perception of light: human vision, colour

vision; Polarization of light: simple states of polarized light, principles of producing linearly polarized light, wave plates.

PHY207: THERMODYNAMICS (2 UNITS)

Basic concepts of thermodynamics; Measurement of temperature; The First Law of Thermodynamics; Entropy and the Second Law of Thermodynamics; Consequences of the first and second laws; Carnot engine; Combined first and second laws; Helmholtz and Gibb functions, Enthalpy, The thermodynamic potentials; phase transitions; Production of low temperatures and the Third Law.

PHY208: NETWORK ANALYSIS AND DEVICES (2 UNITS)

Circuit analysis: circuit elements, Kirchhoff's laws, complex impedances, current-voltage source transformations, circuit theorems; ac and dc circuits: resonant circuits, impedance matching, theory of passive filters, attenuators; Electron devices: vacuum tubes, semiconductor materials, p-n junction diodes, transistors.

PHY261: GEOPHYSICS I (2 UNITS)

Gravity methods: Newton's gravitation, applications; Instruments: gravimeters, zero-length spring; Densities: rocks and ores; Magnetic methods: definitions, concepts; Geomagnetism:

origin, properties of rocks; Gravity and magnetic field survey: instruments, data processing, interpretations; The earth: internal structure and constitution; Field work.

PHY291: PHYSICS LABORATORY I (1 UNIT)

Measurement; Error Analysis; Investigation of the Dependence of the Period of a Pendulum on Length, Amplitude and Mass; Oscillations of a Spring-Mass System and a Torsional Pendulum; A Study of Energy and Momentum Conservation Principles; A Study of Coupled Oscillations; Relation between Wavelength and Frequency of Stationary Waves; Young's Modulus for a Material by Bending of Beams; Measurement of Low Resistance using Carey Foster's Bridge; Variation of Thermo-E.M.F. with Temperature; Frequency Response of A.C. Series Circuits; Zener Diode Characteristics and Zener as A Voltage Regulator; A Study of Transistor Characteristics.

STT211: PROBABILITY DISTRIBUTION I (3 UNITS)

Discrete sample spaces: Algebra and probability of events, combinatorial analysis. Sampling with and without replacement. Conditional probability, Bayes theorem and stochastic independence. Discrete distributions: Binomial, Poisson, negative binomial-hyper geometric and multinomial. Normal approximation to binomial and Poisson, Poisson approximation to binomial. Random variables and expectations: mean, variance, covariance. Probability generating function and moment generating function. Chebychev,s inquality. Continuous joint distributions: marjind as conditional density. Expectations**:** movement**,** movement generating functions. Uniform, normal, beta, Cauchy and hop- normal distributions.

MTH303: VECTOR AND TENSOR ANALYSIS (3 UNITS)

Vector algebra, Vector dot and cross products; Equation of curves and surfaces. Vector differentiation and application; Gradient; divergence and curl; Vector integration, line, surface and volume integrals; Green Stokes's and divergence theorems; Tensor products and vector spaces tensor algebra; symmetry; Cartesian tensors.

PHY301: CLASSICAL MECHANICS (3 UNITS)

Motion under central conservative forces; scattering; Motion in non-inertial frames of reference, Generalized coordinates, Constraints, The Lagrange formulation of mechanics, Hamilton's formulation of mechanics.

PHY302: MODERN PHYSICS II (3 UNITS)

The hydrogen atom; relativistic effects and spin; Identical particles and symmetry; Many electron atoms; Properties of atomic orbits; Optical spectra of the hydrogen atom; Spontaneous and simulated emissions (lasers and masers); Spectra of alkali metals; Quantum effects; Coupling schemes and vector model: j-j couplings. Bohr magneton; Space quantization; Stern Gerlach experiment; Zeeman effect; Hyperfine structure and isotopes and nuclear spin; Nuclear spin number; Molecular spectroscopy: rotation, vibration-rotation, electronic The diatomic molecule; the Frank-Condon principle. X-ray spectra; Microwave methods; Resonance phenomena, ESR, NMR; Optical pumping and Mossbauer scattering.

PHY303: SPECIAL RELATIVITY (2 UNITS)

Einstein's postulates and Lorentz transformation; Consequences of transformations of momentum and energy; Experimental verification of special relativity; Velocity addition theorem and Doppler effect; Electromagnetic 4-vector; Transformation of **E** and **H**; Lorentz force.

PHY304: ELECTRODYNAMICS I (2 UNITS)

Electrostatics and magnetostatics: Lapace equation and boundary value problems; Multipole expansion; Maxwell's equations and electromagnetic potentials; Maxwell's wave equations; Conservation laws.

PHY305: ENERGY (2 UNITS)

Energy and power: principles, demands and outlook, transformation of energy and its costs; Thermal pollution; Electrical energy from fossil fuels; Hydro-electric generation: principles and problems, capacity, storage, reserves, efficiency and environmental effects; Electrical energy

nuclear reactors: energy in future breeder reactors, fusion power, solar power, geothermal power, tidal power, etc.

PHY306: OPTICS (2 UNITS)

Interference by division of wavefront; Interference by division of amplitude; Interferometry; Fresnel diffraction; Fraunhofer diffraction; Diffraction gratings; Diffraction and resolution.

PHY307: SOLID STATE PHYSICS I (2 UNITS)

Crystal structure of solids; Crystal binding; X-ray diffraction in crystals, applications; Thermal properties of the crystal lattice; Elastic properties; Lattice vibrations: phonons; Free-electron theory of metals; Motion of electrons in periodic fields; Hall effect; Energy bands; Semiconductors; Superconductivity.

PHY308: ELECTRONICS I (3 UNITS)

Amplifiers: Classification of amplifiers, equivalent circuit of transistor, operating point and bias stability, operating point and bias stability, small signal amplifier, r-f amplifiers; Oscillators: negative feedback, positive feedback, LC oscillators, RC oscillators; Power supply: power source, dc power unit, performance of rectifier, filter circuits, regulation of output voltage; Linear integrated circuits: the Op Amp and its applications, amplifiers and voltage regulators.

PHY309: QUANTUM MECHANICS I (3 UNITS)

Experimental basis of quantum theory: blackbody radiation, and Planck's hypothesis, electron and quanta; Operators; Postulates of Quantum Mechanics; Correspondence principle, Schroedinger equations and their solutions; Applications: one-dimensional box problem, potential well and bound states, potential barrier, the tunnel effect; The harmonic oscillator.

PHY310: ELECTRONICS II (2 UNITS)

Multistage amplifiers; Power amplifiers; Classes A, B, C, Active and Passive Filters; Power systems: Use of transistors in stabilized power supplies; Field effect transistors.

PHY311: KINETIC THEORY AND STATISTICAL MECHANICS (2 UNITS)

Ideal gases; Transport phenomena; Brownian motion; Real gases; Basic concepts of Statistical Mechanics; the partition function, entropy and probability, equipartition of energy, classical statistics, quantum statistics; condensed states, phase transformations, Applications.

PHY313: MATHEMATICAL METHODS FOR PHYSICS II (3 UNITS)

LinearAlgebra and Functional Analysis; Transformations in linear vector spaces and matrix theory. Hilbert space and complete sets of orthogonal functions; Functions of a complex variable, analyticity, Complex integration; The residue theorem and its applications; conformal mapping; The eigenvalue problem for matrices; Diagonalisation of matrices; Introduction to tensors; Integral equations; Basic notions of group theory; Applications of group theory.

PHY 314: NUMERICAL COMPUTATIONS (2 UNITS)

Errors in numerical computations; Curve fitting; Solution of linear systems of equations; Numerical integration; Numerical solution of ordinary differential equations; Calculus of finite difference; Elements of C++ programming.

PHY351: OPTOELECTRONICS (2 UNITS)

Modulation of light: optical activity electro and magnetic optic effects and devices: Faraday effect, Kerr effect, Acousto-optic effect; Non-linear optics; Lasers: concepts; optical pumping; feedback; population inversion; Classes: doped, gas, liquid, semiconductor; Display devices and photoelectrons: Luminescence; Photoluminescence; photo-conductive detectors; Fibre optics and communication: concepts; fibre optical waveguides; planar dielectric wave guide; step index Fibres: intermodal dispersion; Losses in fibres; Integrated optics.

PHY 361: GEOPHYSICS II (2 UNITS)

Seismic Methods: Elastic properties of rocks; Wave propagation in elastic media; Refraction and Reflection. Seismic: horizontal and inclined multiple interface; instrumentation; field procedures; Velocity Analysis; Methods of processing and interpretation; Application in oil and water prospecting; Borehole Geophysics.

PHY391: PHYSICS LABORATORY II (1 UNIT)

A study of Network Theorems; Calibration of a thermistor and determination of energy gap; Construction and characterisation of power supplies & filters; Study of OPAMP as Summing and Inverting amplifiers; Study of OPAMP as Differentiator and Integrator; Detection and measurement of charge using an OPAMP; Study of some properties of lenses; Spectral analysis using a prism spectrometer; Interference of light- Young's experiment; Spectral analysis using a grating spectrometer; Production, detection and reflection of polarized light; Study of interference of polarized light; Measurement of Cp/Cv by an acoustic method; Phase change.

PHY399 SIWES (6 UNITS)

This is a compulsory course designed to train the students on the Industrial application of Physical knowledge. The course will be undertaken within the country at laboratories, research institutes and industrial plants concerned with physical processes and related fields. Each student will be supervised at least once while on attachment by a designated staff of the school.

GST301: ENTREPRENEURIAL STUDIES I (0 UNIT)

Introduction to entrepreneurship and new venture creation; Entrepreneurship in theory and practice; The opportunity, Forms of business, Staffing, Marketing and the new venture; Determining capital requirements, Raising capital; Financial planning and management; Starting a new business, Feasibility studies; Innovation; Legal Issues; Insurance and environmental considerations. Possible business opportunities in Nigeria. knails, screws making Dyeing/Textile blocks paste making.

PHY401: ELEMENTARY PARTICLE PHYSICS (2 UNITS)

Elementary particles: types; Conservation laws; Particle classification. Strong, electro-magnetic and weak interactions; Particle resonances; Symmetry models: SU (2), SU(3), etc.

PHY402: NUCLEAR PHYSICS (3 UNITS)

Basic nuclear concepts: structure, size, nuclear masses, nuclear forces; Nuclear scattering: nuclear models; Energy spectra of alpha and beta decays; Fermi theory of β -decay; Emission; internal conversion; Nuclear reactions; Interaction of nuclear radiation with matter.

PHY404: ELECTRODYNAMICS II (2 UNITS)

Propagation of plane waves in unbounded isotropic media; reflection, refraction; Transmission lines; Wave guides and resonant circuits; Radiation from an oscillating dipole; Radiation from moving charges.

PHY405: ELECTRONICS III (2 UNITS)

Number systems and codes; Fundamentals of Boolean algebra and flip-flops; Registers counters, memory circuits and analogue/digital converters; Electronic instruments

PHY406: OPTICS III (2 UNITS)

Coherence; Physics of Lasers: Light emission and absorption, prerequisites for a laser, types of lasers, applications; Holography: the principle, the process, applications; Fibre optics: optical fibre, optical communication through fibres.

PHY407: SOLID STATE PHYSICS II (2 UNITS)

Dielectric properties; Magnetism: paramagnetism and diamagnetism, ferromagnetism and anti-ferromagnetism. Magnetic resonance; Imperfections in solids

PHY408: ELECTRONICS IV (3 UNITS)

High input impedance circuits; High frequency oscillators; Modulation and detection; Amplitude Modulation: Square law modulator and detector, switching modulator, envelope detector, double sideband suppressed carrier (DSBSC) modulation, generation of balanced modulator, ring modulation, coherent detector of DSBSC waves, double-balanced modulator; Single sideband modulation (SSB) and demodulator; Vestigal sideband modulation (VSB); Frequency modulated (FM) systems.

PHY409: QUANTUM MECHANICS II (3 UNITS)

Three-dimensional spherical symmetric potentials; Angular momentum and spin of atomic and nuclear particles; Dirac Notation; Multi-electron atoms; Perturbation theory; scattering theory; elastic potential scattering; Green's function and method of partial waves, Applications.

PHY413: MATHEMATICAL METHODS FOR PHYSICS I (3 Units)

Series, solution of second order linear equations. Special Functions: The gamma function; Beta function; Legendre functions; Bessel functions; Hermite and Languerre function, The Dirac Delta function. hypergeometric functions; Sturm Liouville problems; Orthogonal polynomial and functions,; Bessel's and Fourier-Legendre series; Legendre polynomials; Hermite polynomials; Laguerre polynomials. Expansion in series of orthogonal functions; Integral Transforms and Fourier Series: Fourier series and Fourier transforms; Laplace transform; Applications of transform methods to the solution of elementary differential equations of interest in physics and engineering; Partial differential equations; solution of wave and heat equations by Fourier method; Application of Fourier to PDEs;

PHY491: PHYSICS LABORATORY III

400 Level practical in Pure and Experimental Physics

PHY451: IONOSPHERIC PHYSICS (3 UNITS)

The sun and formation of ionized layers; Formation and Structure of D, E and F layers of the ionosphere; Vertical and Oblique propagation of radio waves in the ionosphere; Ionospheric absorption and fading; Ionospheric disturbances.

PHY452: X-RAY CRYSTALLOGRAPHY (3 UNITS)

Crystal Morphology; Crystal Optics; Classification of Crystals Polarization; Interference and Dispersion in Crystals; X-Ray Diffraction Applications in Research and Industry

PHY453: PLASMA PHYSICS (3 UNITS)

Orbits of Individual Particles; Boltzmann Equation; Magnetohydrodynamics; Confinement of Plasmas Research and Industrial Applications

PHY454: ASTROPHYSICS (3 UNITS)

Structure, origin, evolution of stars, galaxies, planets; Stellar Interiors- Equations, Solar model; Stellar Atmospheres-Abundance of Elements; Solar Radiation; Atmospheres.

PHY455: LOWER ATMOSPHERIC PHYSICS (3 UNITS)

Atmospheric composition and structure; Thermodynamics of water vapour and air; Hydrostatic stability and convection; tephigrams; gradient winds. Radiation in the atmosphere: absorption, scattering; Absorption spectra: electronic, vibrational, rotational; Lines and Bands; Broadening processes; pressure/collision; Doppler; Radiometric quantities; definitions and measurements; Radiative transfer equation.

PHY456: NUCLEAR REACTOR PHYSICS (3 UNITS)

Neutron Physics, Flux cross sections; Thermalisation; Fundamentals of thermonuclear reactions, nuclear reactions-Homogeneous and Heterogenous Nuclear reactions – Operation and Control; Reactor Parameters and Control. Reactor Parameters and Critical Sizes; Reactor Kinetics

PHY457: ENVIRONMENTAL PHYSICS (3 UNITS)

Satellite orbits; remote sensing; processing and resolution of satellite images; applications of remote sensing data; structure and composition of earth's atmosphere; energy balance; greenhouse effect and global warning; atmospheric motion, pressure gradient and thermal gradient winds; global weather and climate patterns; environmental modeling; environmental risk-benefit analysis.

PHY461: GEOPHYSICS III (3 UNITS) PREREQUISITES: PHY261

Electrical and electromagnetic methods; Electrical properties of rocks: resistivities and conductivities; Electrical profiling: sounding and interpretations; Electromagnetic methods: classification, applications in geological mapping, groundwater and conductive mineral exploration; Tonnage and quality estimation. Field work.

PHY499: Project

Each student, in consultation with a Departmental academic staff, will select a specific problem in

Physics discipline to be his/her project and will write a research proposal at the beginning of the first semester of level 400. The student will learn how to design, carry out, and evaluate the results of a research project in the university laboratory and/or in the field and at the end, to write and present a seminar on the results of his research project to graduates and staff of the School.