PROGRAMME PROFILE

Programme: B.Sc. (Mathematics/ Computer Science)

Programme Code: 5209

A BRIEF HISTORY OF THE UNIT

Mathematics 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 2008 academic session when the full B.Sc. (Mathematics/ Computer science) progamme took off.

PHILOSOPHY

To chance access of our students to continues educational development having regards to application of Mathematical tool to solve Computer Science and Technology related challenges, while ensuring sustainably of students; relevance in the larger society.

AIMS

The BSc. Mathematics/Computer Science as a combined honours programme is aimed at taking you through the fundamental of the science 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 constraint of face to face teaching.

OBJECTIVE

- Be able to interact with various computation techniques and devices characterising today's workplace.
- To produce numerates individual who not only have or make success in their calli contribute to the economics buoyancy of the Nigerian economy.

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

ADMISSIONS REQUIREMENTS

To be admitted into the B.Sc. Mathematics programme, a candidate is expected to possess at least one of the following:

1. 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.
2. General Certificate of Education (GCE) Advanced level in Mathematics and Physics for entry into 200 level of the programme.
3. National Certificate in Education (NCE) with merit passes in Mathematics and Physics or Physics and Chemistry for entry into 200 level of the programme
4. National Diploma (N.D.) in the Mathematical sciences or equivalent qualification from an institution recognized by Senate for entry into 200 level of the programme.
5. 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.

DEGREE REQUIREMENT

Evaluation: There are two aspects to the assessment of this programme. First, there are tutor

marked assignments (TMA) which is 30% of the total course mark. At the end of the course, 100 – 200 level students would sit for Computer Based Test CBT (e-examination) and 300-400 level students would sit for written examination called Pen on Paper (POP) which has a value of 70% of the total course grade.

Structure of the Programme:

- **Course Credit System**

Subjects taught in the Unit are based on the 'course system' in which the subject areas are broken down into courses which are examinable. The courses are organized into levels (100-400 levels) in an order according to the academic progress.

- **Classification of Courses**

The courses in the Unit are classified as follows:

1. **Compulsory courses:** These are the core courses that must be offered and passed by students at a grade not below E
2. **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.
3. **General Studies Courses:** These consist of the university general studies courses coded GST. They are compulsory courses for all students of the university and are being offered by the University in compliance with the National University Commission (NUC) minimum Bench Mark.

- **Criteria for the award of B.Sc (Mathematics) degree**

The student is required to **pass all compulsory courses** and complete a minimum of 140 credits units of core courses and at least 12 units of electives for 8 semesters to qualify to be admitted into the B.Sc. Mathematics degree. Direct entry must pass minimum of 110 credit units of core courses and at least 10 units of elective courses for a 6 semesters to qualify to be admitted into the B.Sc. Mathematics degree. The compulsory courses are made up of those courses specifically labeled as compulsory (C) and the required elective courses labeled as elective (E).

1. **OUTLINE PROGRAMME PROPOSAL (OPP)**

Outline of Course Structure Mathematics/Computer Science Programme

B.Sc. Mathematics/Computer Science Registrable Courses

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
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
GST101	Use of English and Communication Skills	2	C
GST107	The Good Study Guide	2	C
	Total Credit Units	**23**	

100 Level 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
CHM192	Introductory Practical Chemistry II	1	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
GST102	Use of English and Communication Skills II	2	C
	Total Credit Units	**19**	

200 Level 1st Semester- Compulsory Courses

Course Code	Course Title	Unit(s)	Status
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
GST201	Nigerian Peoples and Culture	2	C
GST203	Introduction to Philosophy and Logic	2	C
	Elective Course	3	
	Total Credit Units	**22**	

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	**3**	

200 Level 2nd Semester- Compulsory Courses

Course Code	**Course Title**	**Unit(s)**	**Status**
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
GST202	Fundamentals of Peace Studies and Conflict Resolutions	2	C
	Elective Course	2	E
	Total Credit Units	**20**	

Elective Courses

CIT292	Computer Laboratory	2	E
STT211	Probability Distribution I	3	E

300 Level 1st Semester- Compulsory Courses

Course Code	Course Title	Unit(s)	Status
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
GST301	Entrepreneurial Studies	2	C
	Elective Courses	6	E
	Total Credit Units	**21**	

Elective Courses

CIT311	Computer Networks	3	E

CIT309	Computer Architecture	3	E
STT311	Probability Distribution II	3	E

300 Level 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	Industrial Training/Siwes	6	C
	Elective Course	3	E
	Total Credit Units	**18**	

Elective Courses

CIT344	Introduction to Computer Design	3	E
CIT371	Introduction to Computer Graphics & Animations	3	E

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
CIT461	Internet Architecture & Communication	3	E
	Total Credit Units Compulsory Courses	**17**	

Elective Courses

CIT461	Internet Architecture& Communication	3	E

400 Level 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
	Elective Course	2	E
	Total Credit Units	**17**	

Elective Courses

CIT474	Introduction to Expert System	2	E

CIT432	Software Engineering II	3	E

Students to take one elective course

1. **SYNOPSES OF COURSES AND DETAILED PROGRAMME PROPOSAL (DPP)**

BIO101: 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.

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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.

BIO191 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.

BIO192 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,

CHM102: 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; DG = DH – TDS

CHM191: 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

CHM192: 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.

GST101: 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.

GST102: 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.

GST105 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.

GST107: 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.

MTH101 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.

MTH102 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

MTH103 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.

STT102 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.

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 (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.

PHY191: 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.

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.

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 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)

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

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.