

Department of Computer Science

Faculty of Science

Ahmadu Bello University, Zaria



**UNDERGRADUATE
STUDENTS HANDBOOK**

100 Level First Semester

Code	Course Title	Credit Units	Prerequisite
MATH101	Sets and Number System	2	O/L Maths
MATH103	Trigonometry and Co-ordinate Geometry	2	“
MATH105	Differential and Integral Calculus	2	“
COSC101	Introduction to Computing	2	“
PHYS111	Mechanics	2	O/L Physics
PHYS131	Heat and properties of matter	2	“

100 Level Second Semester

Code	Course Title	Credit Units	Prerequisite
COSC104	Introduction to Problem Solving	2	O/L Maths.
MATH102	Algebra	2	“
MATH104	Conic Sections and Application of Calculus	2	“
MATH106	Vectors and Dynamics	2	“
STAT102	Introductory Statistics	2	“
PHYS124	Geometric and Wave Optics	1	“

Restricted Elective

Code	Course Title	Credit Units	Prerequisite
PHYS122	Electricity, Magnetism and Modern Physics	2	O/L Physics.
GEOG106	Introduction to Environmental Science	2	

Cognate Courses (General Studies)

Code	Course Title	Credit Units	Prerequisite
GENS101	Nationalism	1	
GENS103	English and Communication Skills	2	
GENS107	History and Philosophy of Science	2	

200 Level First Semester

Code	Course Title	Credit Units	Prerequisite
MATH201	Mathematical Methods I	3	MATH105 or equiv.
MATH207	Linear Algebra I	3	MATH102 or equiv.
COSC211	Object-Oriented Programming I	3	COSC101 or equiv.
COSC203	Discrete Structures	3	MATH101 or equiv.
COSC205	Digital Logic Design	3	COSC101 or equiv.
STAT201	Discrete Probability Distributions	3	STAT102

200 Level Second Semester

Code	Course Title	Credit Units	Prerequisite
COSC212	Object-Oriented Programming II	3	COSC101 or equiv.
COSC204	Computer Organization and Assembly Language	3	COSC101 or equiv.
STAT202	Continuous Probability Distributions and Distribution Techniques	3	STAT101 or equiv.
COSC208	Introduction to Artificial Intelligence	3	COSC101
STAT204	Biometry I	3	STAT102

Cognate Course (General Studies)

Code	Course Title	Credit Units	Prerequisite
GENS202	Entrepreneurship and Innovation	2	

Restricted Departmental Electives

Code	Course Title	Credit Units	Prerequisite
MATH209	Numerical Analysis I	3	MATH104 or equiv.

Unrestricted Electives

Code	Course Title	Credit Units	Prerequisite
COSC206	Human Computer Interaction	2	COSC101 or equiv.
MATH208	Linear Algebra II	3	MATH102 or equiv.

300 Level First Semester

Code	Course Title	Credit Units	Prerequisite
COSC301	Data Structures and Algorithm	3	COSC211
COSC303	Computer Architecture	3	COSC205
COSC305	Systems Analysis and Design	2	COSC101
COSC309	Database Management systems	3	COSC203
COSC311	Organization of Programming Languages	3	COSC211

300 Level Second Semester

Code	Course Title	Credit Unit	Core/elective
COSC300	SIWES	6	

Cognate Course (General Studies)

Code	Course Title	Credit Unit	Core/elective
GENS302	Business Creation and Growth	2	

Restricted Electives

Code	Course Title	Credit Unit	Core/elective
COSC307	Web Application Engineering I	3	COSC101
MATH311	Mathematical Modeling	3	MATH201

400 Level First Semester

Code	Course Title	Credit Units	Prerequisite
COSC400	Project	3	COSC300
COSC401	Algorithms and Complexity Analysis	3	COSC301
COSC403	Software Engineering	3	COSC305
COSC405	Web Application Engineering II	2	COSC307
COSC407	Data Communications and Networks	3	COSC205
COSC411	Operating Systems	3	COSC204

400 Level Second Semester

Code	Course Title	Credit Units	Prerequisite
COSC400	Project	3	COSC300
COSC402	Formal Methods and Software Development	3	MATH201
COSC404	Network Design and Management	3	COSC307
COSC406	Advanced Database Systems	2	COSC309
COSC408	Compiler Construction	3	COSC311

Restricted Electives

Code	Course Title	Credit Unit	Prerequisite
COSC409	Professional and Social Aspects of Computing	3	COSC206
COSC416	Simulation Methodology	3	STAT202
COSC412	Theory of Computing	3	COSC203

COURSE SYNOPSIS

Presented below are the synopses of all the courses under B.Sc. Computer Science and the units of each course have been indicated.

100 LEVEL

100-Level First Semester Courses

COSC101 Introduction to Computing

(2 Credit Units)

Prerequisite: O/Level Mathematics

Introduction to computer systems. Components of computer systems and their functions. Windows operating systems and its utilities. Hands-on exposure to Office application software (MS Office or Open Office): Word processing, spreadsheets, presentation graphics and databases. Introduction to and use of Internet tools and technologies.

PHYS111 Mechanics

(2 Credit Units)

Prerequisite – O/Level Physics.

Units and dimensions; Dimension methods for checking correctness of equations and for deriving simple relations. Additions and subtraction of vectors, projectiles, Newton laws, conservation laws, Elastic collisions, work, energy and power. Circular motion, simple harmonic motion, motion of rigid bodies, statics Gravitational potential, circular orbit, escape velocity.

MATH101 – Sets and Number System**(2 Credit Units)****Prerequisite – O/Level Mathematics**

Sets: Definition of a set, finite and infinite sets, equality of sets, subsets, union, intersection, universal set, complements, empty set, Venn diagram. Symmetric difference, power sets and De-Morgan theorems. Inclusion-Exclusion principle. Elements of relations and functions.

Some Properties of number systems: Natural numbers, integers, rationals, irrationals and reals. Order relations in the set of real numbers. Open and closed intervals on the number line.

Complex Numbers: Definition of a complex number, addition, multiplication and division. Geometric interpretation modulus and conjugation. Polar representation, De-Moivre's theorem, nth roots of a complex number, nth roots of unity.

MATH103 – Trigonometry and Coordinate Geometry**(2 Credit Units)****Prerequisite – O/Level Mathematics**

Circular Measures: Trigonometric ratios of angles of any magnitude, inverse trigonometric functions.

Addition formulae: $\sin(A+B)$, $\cos(A+B)$, $\tan(A+B)$ and their proofs. Multiple and half angles, solutions of simple trigonometric equations. Factor formulae. Solution of triangles, heights and distances (including three-dimensional problems)

Plane Polar Coordinates: Relation between polar and Cartesian coordinates, plotting and sketching of simple curves whose polar equations are known.

Coordinate Geometry of lines and Circles: Pair of straight lines and system of circles. (Emphasis on concepts rather than formulae).

MATH105 – Differential and Integral Calculus**(2 Credit Units)****Prerequisite – O/Level Mathematics.**

Functions of a real variable: Odd, even, periodic functions and their symmetries, graphs, limits and continuity (Intuitive treatment only)

Differentiation: First principle, techniques of differentiation in general. Higher derivatives.

Integration: Integration as the inverse of differentiation, techniques of integration in general, definite integral (Evaluation only).

PHYS131 Heat and Properties of Heat**(2 Credit Units)****Prerequisite – O/Level Physics.**

Structure of solids, liquids and gases. Kinetic theory of gases, Elasticity, surface tension, solid friction. Fluid in motion, Bernoulli's law, Aerofoil; thermodynamics; thermal expansion. Heat transfer. EM radiation, Prevost theory of heat exchange. Thermal radiation detectors; Optical pyrometer.

100-Level Second Semester Courses**MATH102 – Algebra****(2 Credit Units)****Prerequisite – O/Level Mathematics**

Quadratic and other polynomial functions: Elementary properties of quadratic expressions, roots of quadratic equations, application to symmetric functions, polynomial functions of third and fourth degrees, remainder theorem, location of roots.

Permutation and combination: Notion of Factorials, nPr , nCr , and simple applications, mathematical induction principle and applications.

Binomial Theorem: Expansion of all rational index, interval of convergence, approximations and errors.

COSC104 Introduction to Problem Solving**(2 Credit Units)****Prerequisite: O/Level Mathematics**

Introduction to problem solving. The goal of this course is to show you how to increase your power to analyse problems and comprehend what you read and hear. A modest understanding of basic college mathematics is all that is required to take this course. The first part of this course, introduces problems and its types, motivation towards taking a course on problem solving, schools of thought in Problem solving, general precepts to problem solving and common mathematical skills required of a problem solver. The second part describes the nature of man as a problem solver. The model of the human brain and how it works, the effective use of the human memory, thinking logically, deduction and hypothetical thinking etc. The third part focuses primarily on the different strategies for solving problems and finally the last part of the course, concentrates on problem solving using computer systems.

MATH104 – Conic Sections and Application of Calculus**(2 Credit Units)****Prerequisite – O/Level Mathematics.**

Conics: Properties of parabola, ellipse, hyperbola, rectangular hyperbola, their Cartesian and parametric equations, problems involving elimination of parameters, tangents and normals. Rate of Change: Velocity, acceleration and other rates.

Curve Sketching: Asymptotes, maxima and minima. Small increments, approximations and errors. Newton's approximation, simple application of integration to areas and volumes.

Differential equations: First order differential equations only.

MATH106 – Vectors and Dynamics**(2 Credit Units)****Prerequisite – O/Level Mathematics**

Vectors: Geometric representation of vectors in 1-3 dimensions, components, direction cosines. Addition, scalar multiplication, linear independence and dependence of vectors. Scalar and vector products of vectors. Differentiation and integration of vectors w.r.t a scalar variable.

Dynamics: Kinematics of a particle. Components of velocity and acceleration of a particle moving in a plane. Force, momentum, laws of motion under gravity, projectiles, restricted vertical motion, elastic strings, simple pendulum, impulse. Impact of two smooth spheres, and of a restricted sphere and a smooth sphere.

STAT102 Introductory Statistics II**(2 Credit Units)****Prerequisite – O/Level Mathematics.**

Random experiment, Sample space, event space, definitions of probability, conditional probability, addition and multiplication theorems, definition of random variable (discrete and continuous), mathematical expectations of a random variable, addition and multiplication theorems of expectation, definition of moment, relationship between raw moments and central moments, the bi-variate frequency distribution, fitting of curves by method of least squares, concepts of correlation and regression and their coefficients, the rank correlation coefficient.

PHYS122 Electricity, Magnetism and Modern Physics (2 Credit Units)

Prerequisite – O/Level Physics.

Electric force; Field and potential, Electric flux and Gauss's theorem. Capacitances, current electricity, magnetic force, magnetic effects of currents, magnetic materials, electromagnetic induction, Alternating current, Planck's constant quanta of light energy, photo electric effect, Radioactivity, Nuclear composition, binding energy, Nuclear fission and fusion. Thermionic emission, rectification by diodes, transistor.

PHYS124 Geometric Wave and Optics (1 Credit Unit)

Prerequisite – O/Level Physics.

Reflection, refractive index, Snell's law measurement of refractive index, total internal reflection, air cell. Refraction through prism, minimum deviation. Thin lens formula, Lenses in contact, Newton formula. Spherical and chromatic aberrations, power of lenses, Dispersive Powers. Classification of spectra, Optical instruments, interference phenomenon, Newton rings, Polarization, Malus's law, polaroids

GEOG106: INTRODUCTION TO ENVIRONMENTAL SCIENCE (2 Credit Unit)

Pre-requisite (O/L Geography)

Environmental processes: Energy transfers and the basis of life. Resources: The distribution and use of renewable and non-renewable resources. Industrialization – the environmental problems that arise from population growth, urbanization and industrialization. Management – The resolution of the demands placed upon the environment.

200 LEVEL

200-Level First Semester Courses

COSC211 Object-Oriented Programming I (3 Credit Units)

Prerequisite: COSC101 or Equivalence

Overview of computers and computing; Introduction to object-orientation as a technique for modeling computation. Introduction of a typical object-oriented language, such as Java; Basic data types and operators; Basic object-oriented concepts; Introduction to Strings; Simple I/O; Logical expressions, control structures, algorithms and problem solving; Arrays; Simple recursive algorithms; inheritance; polymorphism.

COSC203 Discrete Structures (3 Credit Units)

Prerequisite: MATH101 or Equivalence

Functions and relations. Basics of counting: inclusion-exclusion principle, pigeon-hole principle, permutations, recurrence relations, generating functions. Graphs and trees: definitions, properties and applications. Discrete probability: computing probabilities, dependent and independent events, applications.

COSC205 Digital Logic Design (3 Credit Units)

Prerequisite: COSC101 or Equivalence.

Introduction to information representation and number systems. Boolean algebra and switching theory. Manipulation and minimization of completely and incompletely specified Boolean functions. Physical properties of gates: fan-in, fan-out, propagation delay, timing diagrams and tri-state drivers. Combinational circuits design using multiplexers, decoders, comparators and adders. Sequential circuit analysis and design, basic flip-flops, clocking and timing diagrams. Registers, counters, RAMs, ROMs, PLAs, PLDs, and FPGAs.

MATH201 – Mathematical Methods - I**(3 Credit Units)****Prerequisite – MATH105 or equivalence**

Applications of Calculus: Revision of different techniques of differentiation, successive differentiation, Leibniz's theorem, Taylor and Maclaurin series. Tangents and normals to plane curves, curvature, Definite integrals. Methods of integration, reduction formulae, lengths of arc of a plane curve. Area enclosed by a plane curve.

Differential Equations: Concept of differential equations. First order ordinary differential equations of the forms; variable separable, homogeneous, exact and linear. Second order ordinary linear differential equations with constant coefficients, auxiliary equation, and cases of auxiliary equations having distinct, equal, and complex roots, complementary functions and particular integrals in connection with non-homogeneous equations. Uses of the operator $D = d/dx$ and the method of undetermined coefficients for calculating particular integrals. Differential equations of Euler's type of second order. Solutions of systems of two linear differential equations. Second order Ordinary Linear Differential Equations with variable coefficients; reduction of order, variation of parameters.

Partial Differentiation: Real valued functions of two and three variables. Partial derivatives, chain rule, Jacobian. Extrema, Lagrange's multipliers, increments, differentials and linear approximations.

MATH207 – Linear Algebra I**(3 Credit Units)****Prerequisite – MATH102 or equivalence**

Matrices: Definition, types of matrices, algebra of matrices, matrix as a sum of symmetric and skew symmetric matrices. Elementary operations of matrices and echelon form, equivalence matrices. Inverse of a matrix.

Systems of linear equations and matrices: Systems of m linear equations in n unknowns and their solutions. Gaussian elimination by pivot method and matrix representation. Solution of the system using Gaussian elimination and Gauss-Jordan reduction.

Determinants: Definition, evaluation of determinants. Cofactor expansion, inverse of a non-singular matrix. Solution of systems of linear equations using Cramer's rule.

MATH209 – Numerical Analysis I**(3 Credit Units)****Prerequisite – MATH105**

Accuracy in numerical calculations: errors and their sources, error accumulation in different operations.

Finite differences: difference operators and difference table.

Evaluation of functions: using series approximation, solution of polynomial, algebraic and transcendental equations, curve fitting.

Interpolation: Newton's difference formulae, central difference formulae, Lagrange's formula. Numerical differentiation. Numerical Integration

STAT201 - Discrete Probability Distributions**(3 Credit Units)****Prerequisite – STAT102**

This course introduces students to discrete probability distributions so that they acquire the fundamental and basic concepts required in gaining deeper understanding of statistical distributions in statistics and how it relates to other areas. deals with the concept of probability, mathematical definition of probability, laws of probability, axioms of probability, cumulative distribution functions, Bayes theorem,

random variables, Bernoulli distribution, Binomial distribution, Poisson and mathematical expectation. While the second four sessions (module two) deals with the Geometric distribution, Hypergeometric distribution, Negative Binomial distribution, Moment generating functions and fitting of discrete probability distributions. The sessions will direct students to work on exercises related to the required reading and to carry out practical or computer based exercises where appropriate. A number of self-tests are associated with each session. These tests give students an indication of his progress on the course. The exercises as well as tutor marked assignments will help the students in achieving the stated learning objectives of each session and of the entire course.

200 - Level Second Semester Courses

COSC212 Object-Oriented Programming II

(3 Credit Units)

Prerequisite: COSC102 or Equivalence

Advanced object-oriented programming - polymorphism, abstract classes and interfaces: Program organization using packages/namespaces; Use of API – use of iterators/enumerators, List, Stack, Queue from API; Recursion; Event-driven programming.

COSC204 Organization and Assembly Language

(3 Credit Units)

Prerequisite: COSC101 or Equivalence

Introduction to computer organization. Signed and unsigned number representation, character representation, ASCII codes. Assembly language programming, instruction format and types, memory and I/O instructions, dataflow, arithmetic, and flow control instructions, addressing modes, stack operations, and interrupts. Data path and control unit design. RTL, microprogramming, and hardwired control. Practice of assembly language programming.

COSC206 Human Computer Interaction

(2 Credit Units)

Prerequisite: COSC101 or Equivalence

Foundation of HCI, principles of GUI, GUI toolkits. Human-centered software evaluation and development; GUI design and programming.

COSC208 Introduction to Artificial Intelligence

(3 Credit Units)

Prerequisite: COSC101 or Equivalence

Introduction to the types of problems and techniques in Artificial Intelligence. Problem-Solving methods. Major structures used in Artificial Intelligence programs. Study of knowledge representation techniques such as predicate logic, non-monotonic logic, and probabilistic reasoning. Examples of expert systems. Introduction to natural language understanding and various syntactic and semantic structures. Expert systems. Introduction to computer image recognition.

MATH208 – Linear Algebra II

(3 Credit Units)

Prerequisite – MATH102

Vector Spaces: Review of basic definitions and examples of vector spaces. Subspaces, linear dependence and independence. Bases, dimension of a vector space. Homomorphism and quotient space. Direct sum, Dual spaces.

Linear Mappings and Matrices: General linear transformation of n-dimensional into m-dimensional space, matrix representation of a linear map, similar matrices and change of basis. Eigenvalues and eigenvectors. Characteristic polynomial and characteristic equation. Caley-Hamilton theorem. Orthogonal diagonalization.

Canonical Forms: Primary decomposition theorem, Triangular Jordan and Rational forms for linear operator (square matrices). Quadratic and bilinear forms.

STAT202 - Continuous Probability Distributions and Distribution Techniques **(3 Credit Units)**

Prerequisite – STAT102

Univariate continuous probability distributions such as Normal, Uniform, exponential, type I and type II beta and gamma distributions, various properties of these distributions, fitting of normal distribution. Concept of Bi-variate probability distribution, joint, marginal, conditional probability distribution, covariance and correlation of bi-variate r.v. sampling distribution and standard errors of statistics, distribution of functions of random variables using the techniques such as cumulative distribution function technique, moment generating function technique and transformation technique.

STAT204 - Biometry I **(3 Credit Units)**

Prerequisite – STAT102

This course introduces the application of basic statistical methods used in biological research; estimation and inference. The role of statistics in the design of a good biological experiment would be carefully considered

300 LEVEL

300 - Level First Semester Courses

COSC301 Data Structures and Algorithm **(3 Credit Units)**

Prerequisite: COSC212 or Competence in Programming

Review of object-oriented concepts; Basic algorithm analysis - the big-O notation; Fundamental data structures – implementation strategies for stacks, queues and lists; Recursion; Implementation strategies for tree and graph algorithms; Hash tables; Application of data structures.

COSC303 Computer Architecture **(3 Credit Units)**

Prerequisite: COSC205

Memory hierarchy and cache memory. Integer and floating point arithmetic. Instruction and arithmetic pipelining, superscalar architecture. Reduced instruction set computers. Parallel architectures and interconnection networks.

COSC305 Systems Analysis and Design **(2 Credit Units)**

Prerequisite: COSC211 or Competence in Programming

The software development life cycle: conception, business case, business context, system requirements, requirements analysis, systems analysis, design, implementation, testing, deployment, maintenance. The Unified Modeling Language (UML): models, use case diagrams, activity diagrams and state chart diagrams, sequence and collaboration diagrams, class diagrams, component diagrams. Managing the process: customers, organization types, project management, teams and team dynamics, computer assisted software engineering (CASE) tools, documentation.

COSC307 Web Applications Engineering I **(3 Credit Units)**

Prerequisite: COSC211 or Competence in Programming

The Internet (brief history, Internet protocols and Internet services); The Web architecture (Client-server architecture, multi-tier architecture, URL); XHTML; DHTML (Cascaded Style Sheet, JavaScript, DOM); Web interface and interactivity design principles and practice. Incorporating multimedia content into Web pages (using Photoshop, Flash or similar tools).

COSC309 Database Management Systems

(3 Credit Units)

Prerequisite: COSC211

Basic database concepts. Conceptual modeling. Relational data model. Relational theory and languages. Database Design. Database security and integrity. Introduction to query processing and optimization. Introduction to concurrency and recovery.

COSC311 Organization of Programming Languages

(3 Credit Units)

Prerequisite: COSC211 or Competence in Programming

Concepts of Programming languages: Syntax and semantics. Data types. Control structures. Sub-Programs. Exception handling. Run-time Storage Management. Programming Paradigms: Imperative, functional, logic, object-oriented and concurrent.

MATH311 – Mathematical Modeling

(3 Credit Units)

Prerequisite – MATH201

Methodology of Model building: Identification, formulation and solution of problems. Cause-effect diagrams. Modeling using graphs and proportionality: modeling by interpolation using polynomials. Modeling using Least squares and Linear programming. Modeling deterministic behavior and probabilistic processes. Modeling using derivatives: applications using differential equations.

400 LEVEL

400-Level First Semester Courses

COSC400 Project

(6 Credit Units)

Prerequisite: COSC300

The project aims to provide experience with planning, executing and formally reporting on a substantial computing task within a set time. Students will develop their understanding of relevant areas of computing and their capabilities in the practical engineering and writing activities involved, and demonstrate their competence as candidate computing professionals.

An essay on a topic selected from a list covering generalized areas of economic disciplines dealing with significant current economic problems. This is to be presented in at least five (5) chapters of not less than sixty (60) pages of A4 paper and double spaced type with 14 font size characters following the format below:

CHAPTER ONE: Introduction

CHAPTER TWO: Literature review and Theoretical frameworks.

CHAPTER THREE: Methodology – method of data presentation, analysis and interpretation.

CHAPTER FOUR: Data presentation, analysis and interpretation.

CHAPTER FIVE: Summary, conclusion and recommendations.

Students are required to write and submit to their supervisor three topics which must be formed from the given sub-themes of that session and are expected to research and gather enough materials on the topic of interest they want to write on before forwarding it to their supervisor for approval.

COSC401 Algorithm and Complexity Analysis**(3 Credit Units)****Prerequisite: COSC301**

Introduction to algorithms and review of data structures; fundamentals of algorithm analysis; Analyzing recursive and non-recursive algorithms; Algorithm design techniques: brute-force, divide-and-conquer, greedy algorithms, dynamic programming, search techniques; NP-complete problems and approximation algorithms.

COSC403 Software Engineering**(3 Credit Units)****Prerequisite: COSC305**

Fundamental design concepts, design notations, and architectural design methods for large-scale software systems. Several design: examples of their use, comparisons among them. Concepts of information hiding, data abstraction, concurrency, and object-oriented software construction.

COSC405 Web Application Engineering II**(2 Credit Units)****Prerequisite: COSC307**

Review of client-side application development. Server-side application development. Adding content to Web applications dynamically. Input validation and use of regular expressions. Defining and managing sessions. Cookies. Working with databases. Web application security.

Assignments and projects should be given to enable students design and implement non-trivial data-driven Web applications.

COSC407 Data Communications and Network**(3 Credit Units)****Prerequisite: COSC205**

Introduction to computer networks and layered architectures: connectivity, topology, circuit and packet switching, TCP/IP and ISO models; Application layer: C/S model, DNS, SMTP, FTP, WWW, socket programming and network security; Transport layer: TCP and UDP, congestion control; Network layer: internetworking, addressing and routing algorithms and protocols; Data link layer: framing, flow and error control protocols, PPP, MAC and LANs; Physical layer: principles of data communications, circuit switching, coding, multiplexing and transmission media. Network security: fundamentals of cryptography, secret and public key algorithms, authentication protocols.

COSC409 Professional and Social Aspects of Computing**(3 Credit Units)****Prerequisite: COSC206**

Professional aspects; professions and the professional; professional institutions; professional ethics and responsibilities; the computer professional as expert witness. Standards, best practice. Legal background, sources of law; civil and criminal law. Intellectual property rights, software copyright, patents, designs, trademarks and passing off; copyright and webpages, Internet domain names, protection of computer imagers and icons, jurisdiction; confidentiality. Data protection law; freedom of movement of personal data; privacy in telecommunications. Computer crime; fraud; computer misuse; viruses; threatening emails; pornography; grooming in chat rooms. Social aspects of the workplace/society at large. The impact of IT on society.

COSC411 Operating Systems**(3 Credit Units)****Prerequisite: COSC301**

Fundamentals of operating systems design and implementation. History and evolution of operating systems; Types of operating systems; Operating system structures; Process management: processes, threads, CPU scheduling, process synchronization; Memory management and virtual memory; File systems; I/O systems; Security and protection; Case-study.

COSC413 Computational Science and Numerical Methods**(3 Credit Units)****Prerequisite: MATH209**

History and importance of computational science, overview of application areas, review of required skills. High-performance computing: processor architectures, memory systems for high performance, input/output devices, pipelining, parallel languages and architectures. Scientific visualization: presentation of results, data formats, visualization tools and packages. Application of high-performance computing to scientific and engineering problems.

400 - Level Second Semester Courses**COSC402 Formal Methods in Software Development****(3 Credit Units)****Prerequisite: COSC212**

Mathematical foundations for formal methods. Formal languages and techniques for specification and design, including specifying syntax using grammars and finite state machines. Analysis and verification of specifications and designs. Use of assertions and proofs. Automated program and design transformation.

COSC404 Network Design and Management**(3 Credit Units)****Prerequisite: COSC205**

Overview of network design and management; Design methodologies; Network management strategies; Network configuration management; Network management protocols: SNMP, and RMON; Network management tools and systems; Network management applications; Desktop and web-based network management; Network troubleshooting.

COSC406 Advanced Database Systems**(2 Credit Units)****Prerequisite: COSC309**

Advanced data models. Conceptual Database design. Concurrency control techniques. Recovery techniques. Query processing and optimization. Integrity and security. Client-server architecture. Distributed database systems. Current trends in database systems.

COSC408 Compiler Construction**(3 Credit Units)****Prerequisite: COSC212**

Design and implementation of compilers, principles of languages translation. Each student implements a complete compiler for a small but substantial language. The stages of a compiler. Boot-strapping a compiler. Lexical analysis, regular expressions, finite state machines. Syntactic analysis, context free grammars, parsers. Semantic analysis, type checking, symbol tables. Syntax-directed translation. Data flow analysis, peephole optimization. Code generation.

COSC416 Simulation Methodology**(3 Credit Units)****Prerequisite: STAT202**

Introduction and comparison with other techniques, discrete simulation model, generation of pseudo random numbers, statistical testing. Implementation of queuing theory, simulation languages and packages. System Models, System Studies, Techniques of System simulation, continuous system simulation, introduction to GPSS.

COSC412 – Theory of Computing**(3 Credit Units).****Prerequisite – COSC301**

The course covers the important formal languages in the Chomsky hierarchy -- the regular sets, the context-free languages, and the recursively enumerable sets -- as well as the formalisms that generate these languages and the machines that recognize them. The course will also introduce the basic concepts of computability and complexity theory by focusing on the question, "What are the fundamental capabilities and limitations of computers?"

The concepts covered in this course will be amply illustrated by applications to current programming languages, algorithms, natural language processing, and hardware and software design.

STAT412 – Operations Research**(3 Credit Units).****Prerequisite – MATH311**

Classical methods of optimization, Maxima and minima, Lagranges' multipliers. Linear programming: Convex sets and functions, simplex and revised simplex methods, duality theory, applications. Linear programming applications to diet problems, transportation problems, manufacturing problems, Network Analysis, etc.

SERVICE COURSES**COSC264 – Fundamentals of Data Processing****(2 Credit Units).****Prerequisite – O/L MATHS**

Data processing cycle & Operations, Developments in Data processing, storage media, punched-card recording & processing, electronic data processing, communicating with the computer, computer codes & arithmetic, flowcharts & programming techniques, data structure.

COSC265 – Introducing Computer**(2 Credit Units).****Prerequisite – O/L MATHS**

Computer (definition, types generation, history)
Computer (structure, components, number system)
Computer Software (type, application, systems, packages, languages, machine, symbolic high level languages, most popular languages)
Networks Topology; star, ring mesh, bus
Popular packages (database, spreadsheet, word processing, Dos windows with practice on information retrieval using data based management system commands)
Computer applications in Library and Nursing

COSC344 – Computer Knowledge and FORTRAN Programming

(3 Credit Units).

Prerequisite – O/L MATHS

Binary, Octal and Hexadecimal number systems, conversion complement of numbers. Representation of negative numbers, Digital computers, main functional elements of a computer (memory, central and arithmetic units, input-output devices; backing storages). Information in the core store.

Binary coded decimal, fix and floating point representations, programming languages (short summary of the machine code. Assembly, machine and problem oriented languages). The flow chart language, Loops, interaction. The basic FORTRAN Numerical data, arithmetic, arrays, input-output, control statements, sementation of programmes, statement function, function and subroutine segments. Common, equivalence statements.