Faculty of Computing Science and Engineering
Department of Computer Engineering

Course Contents

BSc. Information and Communication Technology

PART I: HARMATTAN SEMESTER

Grouping	Course Code	Course Title	Prerequisites/ Corequisites	L-T-P	Units
(a) Core-compulsory courses	MTH101	Elementary Mathematics I		4-1-0	5
	PHY101	General Physics I		3-1-0	4
	PHY107	Experimental Physics IA		0-0-3	1
	CHM101	Introductory Chemistry I		3-1-0	4
	CHM103	Practical Chemistry I		0-0-3	1
(b) General Studies	TPD101	Engineers in Society		1-0-0	1
	SE_???	Special Elective		2-0-0	2
	SE_???	Special Elective		2-0-0	2
	SE_???	Special Elective		2-0-0	2
				17-3-6	**22**

PART I: RAIN SEMESTER

Grouping	Course Code	Course Title	Prerequisites/ Corequisites	L-T-P	Units
(a) Core-compulsory courses	MTH102	Elementary Mathematics II		4-1-0	5
	MTH104	Vectors		2-0-0	2
	PHY102	General Physics II		3-1-0	4
	PHY108	Experimental Physics IB		0-0-3	1
	CHM102	Introductory Chemistry II		3-1-0	4
	CHM104	Practical Chemistry II		0-0-3	1
(b) General Studies	SE_???	Special Elective		2-0-0	2
	SE_???	Special Elective		2-0-0	2
	SE_???	Special Elective		2-0-0	2
				18-3-6	**23**

PART II: HARMATTAN SEMESTER

Grouping	Course Code	Course Title	Prerequisites/ Corequisites	L-T-P	Units
(a) Core-compulsory courses	CSC201	Introduction to Computer Programming		2-0-3	3
	CPE203	Digital Computer Systems I	CPE102	2-0-0	2
	MTH201	Mathematical Methods I	MTH102	3-1-0	4
	MEE203	Engineering Drawing I		1-0-3	2
	MEE205	Engineering Mechanics I		2-1-0	3
	CHE201	Intro. to Thermodynamics		2-1-0	3

	EEE251	Fundamentals of Electrical and Electronic Engineering I	PHY102	2-1-0	3
	EEE281	Fundamentals of Electrical and Electronic Engineering Laboratory I		0-0-3	1
(b) General Studies	MSE201	Elements of Engineering Materials		2-0-3	3
				14-4-9	**24**

PART II: RAIN SEMESTER

Grouping	Course Code	Course Title	Prerequisites/ Co-requisites	L-T-P	Units
(a) Core-compulsory courses	CVE 202	Strength of materials			2
	MEE 204	Engineering Drawing II	MEE 203	1-0-3	2
	CPE204	Digital Computer Systems II	CPE203	2-0-0	2
	CPE206	Digital Systems Laboratory		0-0-3	1
	MTH202	Mathematical Methods II	MTH201	3-1-0	4
	MEE206	Engineering Mechanics II	MEE205	2-0-0	2
	AEE202	Workshop Practice		1-0-3	2
	EEE252	Fundamentals of Electrical and Electronic Engineering I	EEE251	3-0-0	3
	EEE282	Fundamentals of Electrical and Electronic Engineering Laboratory I	EEE281	0-0-3	1
(b) G.S.	SE ???	Special Elective		2-0-0	2
				14-1-18	**21**

LONG VACATION

Grouping	Course Code	Course Title	Prerequisites/ Co-requisites	L-T-P	Units
Core Course	ICT200	Student Workshop Experience Programme (SWEP)		0-0-9	3

PART III: HARMATTAN SEMESTER

Grouping	Course Code	Course Title	Prerequisites/ Corequisites	L-T-P	Units
(a) Core-compulsory courses	ICT 303	Operating System	CSC201	2-0-3	3
	CPE303	Digital System Design I with HDL	CPE 203 & 204	1-1-0	2
	ICT311	ICT Laboratory I		0-0-3	1
	EEE361	Electric Circuit Theory		1-0-3	2
	EEE358	Electromagnetic Theory		2-0-3	3
	EEE351	Microelectronics devices and Circuits I	EEE252	2-0-0	3
	EEE 353	Electric Machines	EEE252	2-1-0	3
	CHE305	Engineering Analysis I	MTH202	2-1-0	3
	ICT 301	Database Design and Management		2-0-2	2
	SE ???	Special Electives		2-0-0	2
				15-3-15	**24**

PART III: RAIN SEMESTER

Grouping	Course Code	Course Title	Prerequisites/ Co-requisites	L-T-P	Units
(a) Core-compulsory courses	EEE360	Measurement and Instrumentation		2-0-3	3
	ICT304	Communication Principles		2-0-0	2
	CPE314	Computer Engineering Laboratory II	CPE303	0-0-6	2
	ICT302	Computer Organization and Architecture		2-1-0	3

Grouping	Course Code	Course Title	Prerequisites/ Co-requisites	L-T-P	Units
	ICT 306	Software Development Techniques		3-0-0	3
	AEE302	Statistics for Engineers		2-0-0	2
	CHE306	Engineering Analysis II	CHE305	2-1-0	3
(b) G.S.	SE ???	Special Electives		2-0-0	2
	SE _???	Special Electives		2-0-0	2
				14-1-12	**22**

LONG VACATION

Grouping	Course Code	Course Title	Prerequisites/ Co-requisites	L-T-P	Units
Core-compulsory courses	ICT 300	Student Industrial Work Experience Scheme I		0-0-9	3

PART IV: HARMATTAN SEMESTER

Grouping	Course Code	Course Title	Prerequisites/ Co-requisites	L-T-P	Units
(a) Core-compulsory courses	ICT401	Cyberprenuership and Cyber law		2-0-0	2
	ICT403	Computer Security Techniques		2-0-0	2
	ICT 415	Internet Technology and Programming		2-1-0	3
	ICT 411	ICT Laboratory II		0-0-6	2
	ICT 405	Data Communication and Networks		2-1-0	3
	ICT 407	System Analysis and Design		2-0-0	2
	CPE 407	Control Systems		1-1-0	2
	CVE401	Technical Report Writing		2-0-0	2
	ICT 413	Satellite Communication		2-0-0	2
	ICT 417	Mobile Communication and Network		2-0-0	2
				12-3-9	**22**

PART IV: RAIN SEMESTER AND LONG VACATION

Grouping	Course Code	Course Title	Prerequisites/ Co-requisites	L-T-P	Units
Core-compulsory courses	ICT400	Student Industrial Work Experience Scheme II	Not more than 12 Units outstanding	0-0-27	9

PART V: HARMATTAN SEMESTER

Grouping	Course Code	Course Title	Prerequisites/ Co-requisites	L-T-P	Units
	ICT 503	Java Technology and Programming		2-0-3	3
	ICT503[1]	Individual Project I		0-0-9	3
	ICT 501	Digital Signal Processing		2-0-0	2
	CPE 513	Embedded System Design	CPE 303	2-0-0	2
	ICT 505	Neural Networks and Deep Learning		2-1-0	3
	ICT 509	Computer Graphics and Animation		2-0-0	2
	ICT 507	Introduction to Enterprise Resource Planning Systems		2-1-0	3

Grouping	Course Code	Course Title	Prerequisites/ Co-requisites	L-T-P	Units
	TPD503	Production/Operations Management & Industrial Law		2-0-0	2
		Electives (At least 2 Units of Restricted Electives)			
	ICT 515	Multimedia Technology and Programming		2-0-0	2
	ICT 517	Data Structure and Algorithm		2-0-0	2
	CPE521	Reinforcement Learning and Control		2-0-0	2
	CPE 525	Digital Image Processing		2-0-0	2
				15-1-21	**22**

PART V: RAIN SEMESTER

Grouping	Course Code	Course Title	Prerequisites/Co-requisites	L-T-P	Units
(a) Core-compulsory courses	ICT 502	Reliability and Maintainability of Hardware Systems		2-1-0	3
	ICT 504	Individual Project II	CPE 503	0-0-9	3
	ICT 506	Industrial Applications Studies		2-0-3	3
	ICT 520	Design & Installation of Electrical & ICT Services		2-0-3	3
	ICT 508	Antenna & Propagation		2-0-0	2
	ICT 510	Software Engineering		2-1-0	3
	TPD 502	Technology Policy		2-0-0	2
		Electives (At least 2 Units of Restricted Electives)			
	CPE 522	Cryptography Principles and Applications		2-0-0	2
	ICT 516	Communication Systems Engineering		2-0-0	2
	ICT 518	Random Process and Queuing Theory		2-0-0	2
				14-1-15	**21**

ICT 301 Database Design & Management (2 Units: LH 30)

Overview of Database systems: model, schema, instance. Database system vs. File systems. Data abstraction level, database languages, system architecture. Classification of DBMS. Data modelling: Entity-Relationship (ER) Model, Entities and Entity types, Relationship and Relationship type, Constraints, Weak Entity Types ER, Diagrams. Schematic object model. Process of database design: requirement analysis, conceptual database design, database schema design. Database design using entity-relationship and semantic object models, database application design. Terminology in Relational Data model, Integrity Constraints, Primitive Operations on Relations, Relational Algebra (RA), Relational Algebra Operations, Relational Completeness, Additional Operations on Relations. Foundations of relational implementations. Structured Query Language (SQL): DML Features in SQL, DDL in SQL, updates in SQL, Views in SQL, Embedded SQL, Query-by-Example (QBE). Concurrency, recovery and security issues. Armstrong's inference rules and minimum covers, normal forms. Current trends in database systems: Client-Server database systems, Open Database Connectivity (ODBC) standard, Knowledge-Based Systems, data warehousing and data mining concepts, Web databases.

ICT 304 Communication principles (3 Units: LH 45)

Amplitude modulation; double sideband, single sideband and vestigial sideband modulation schemes; simple modulators, power and bandwidth performance. Angle modulation; frequency modulation, phase modulation, band width requirements, clippers and limiters. Amplitude modulated signal reception; discrimination, frequency tracking loop, phase locked loop and noise performance. Commercial radio systems. Transmission media; attenuation in open space, air, cable and fibre channels; construction of cables and fibres, sampling theorem, pulse amplitude modulation, pulse width modulation, multiplexing, quantization systems and pulse code modulation, delta modulation, courses and correction of errors in PCM and DM.

ICT 305 Software Development Techniques (2 Units: LH 30)

Software development life cycle. Top-Down design. Program, design using pseudo-code, flowchart. Flowchart ANSI symbols and usage. Extensive examples, and exercises using pseudo-code/flowchart to solve practical problems in engineering. Debugging and documentation techniques. Programming using a structural language such as C: Symbols, keywords, identifiers, data types, operators, various statements, operator precedence, type conversion, conditional and control structures, function, recursive functions. Arrays: 1-D, and multi-dimensional arrays, passing elements or whole array to a function. Simple sorting and searching on arrays, pointers, strings, dynamic memory allocation. Structures and Unions: Structure declaration and definition, accessing structures, array of structures, pointers and structures, union declaration, enumerated variables. File Handling: Concept of a file, files and streams, standard file handling functions, binary files, random access files. Advanced Topics: Command line parameters, pointers to functions, creation of header files, stacks, linked lists, bitwise manipulation. Software development in C in MS Windows, UNIX/LINUX environments, header file, preprocessor directives, make, makefile. Static and dynamic linking libraries. Extensive examples, and exercises programming in C to solve practical problems in engineering. Exercises are to be done in the Computer Laboratory.

ICT 310 Computer Organization and Architecture (3 Units: LH 45)

Introduction to basic concepts of computer organization and design: metrics for computer performance, computer arithmetic, Von Neuman architecture, instruction implementation, Control unit, pipelining, memory systems hierarchy, cache memories and basic I/O controllers

ICT 401 Cyberpreneurship & CyberLaw (2 Units: LH 30)

Introduction: Definition of creativity, innovation, examples of creativity leading to innovation, commercialization of creative and innovative ideas. Trends in technology development. Entrepreneurship management and ownership. Characteristics of entrepreneur, starting a new business, business planning, strategic planning & management, site selection and layout. Establishing new venture, risk management. Business Plan Development: definition, need, preparation of business plan. Forecasting developments and charting an action plan. Identifying the product/service, market research and feasibility study. Financing business. Sources of debt financing. Creating the marketing plan, pricing, creative advertising and promotion. Entrepreneurship case studies: Overview and analysis of successful entrepreneurs such as Bill Gates, Michael Dell, David Filo and Jerry Yang of Yahoo, etc. Nigerian Entrepreneurship: Discussion of Nigerian business environment, and illustrated with successful Nigerian entrepreneurs. Overview of the Nigerian Legal System: Civil and criminal. Basic concepts of law. Contract Law. . Current issues: digital signatures, Intellectual property and copyright. Speech Law: Defamation, Sedition, Printing Press Act. Speech on the Internet. Advertising Code: Made in Nigeria rules and guidelines, Advertising Standards. Media and Licensing law in Nigeria: Developing an in-depth understanding of the nature and function of Nigerian media law. Public and. Private licensing. Intellectual and moral rights. Music royalties, synchronization rights, performance rights. Role of music publishers. Broadcast rights, merchandising. Detailed analysis of Communications and Multimedia Act. Ethic and Etiquette: New codes of social behaviour: the right to privacy.

ICT 402 Satellite Communication (3 Units: LH 45)

Satellite frequency bands bands transmission and multiplexing schemes, trans-multiplexing, multiple access schemes. Satellite orbit satellite motion, paths, geostationary satellites, non-geostationary constellations, satellite subsystems, and satellite launching. Antennas: types, gain, pointing loss, G/T, EIRP; high power amplifiers; low noise amplifiers; BUC/LNB: conversion process, polarization hopping redundancy configurations; earth station monitoring and control. Basic link analysis, attenuation, sources of interference, carrier to noise and interference ratio system availability, frequency reuse, link budget, link design. Multiple access techniques: companded FDM-FM-FDMA, SSB-AM-FDMA, amplitude and phase nonlinearities, optimized earner to noise and intermodulation ratio; TDMA : frame structure, burst structure, frame efficiency, super-frame structure, frame acquisition and synchronization, satellite position determination, TDMA equipment, advanced TDMA satellite systems; CDMA: direct sequence CDMA (DS-CDMA), sequence synchronous and sequence asynchronous DS-CDMA, random access DS-CDMA, link analysis, FH-SS systems, FH-CDMA, acquisition

and synchronization. Demand assignment multiple access (DAMA): types of demand assignments, DAMA characteristics, real time frame reconfiguration, DAMA interfaces, SCPC DAMA, SPADE, digital speech interpolation. Message transmission by FDMA: M/G/l queue, message transmission by TDMA : pure ALOHA- satellite packet switching, slotted ALOHA, packet reservation, tree algorithm. Advantages and disadvantages of multibeam satellites, interconnection by transponder hopping, interconnection by on-board switching (SS/TDMA), interconnection by beam scanning, ISL : GEO-LEO, GEO-GEO, LEO-LEO, RF and optical links. VSAT networks: VSAT technologies, network configurations, multi-access and networking,

ICT 403 Computer Security Techniques (2 Units: LH 30)

History of cryptographic System, Public Key Systems, Digital Signature. Information Theory: Entropy,Perfect Secrecy, Unicity Distance, Complexity Theory, NP Completeness, Number Theory. Data Encryption Method Ciphers, Knaspsack Ciphers, Breakable NP-Complete Knapsack, Encryption Standards DES, RSA, Elliptic Curves. Cryptographic Techniques: Block and Stream Ciphers, Autokey, Endpoints of Encryption, One-Way Ciphers, Password and Authentication, Secret Keys and Public Keys, Threshold Scheme. Video Scrambling techniques. Digital video encryption techniques: principle, IRDETO, Viaaccess, Videoguard, etc. Security and Legality Issues: Copyrights, Patents, Trade Secret, Ownership of Products, Computer Crimes, Ethnical Issue in Computer Security.

ICT 405 Data Communication and Network Applications (3 Units: LH 45)

Introduction to Data communications: the Development of Data Communications; types and sources of data, simple communications network, transmission definitions, one way transmission, half duplex transmission, transmission codes, transmission modes, parallel transmission, serial transmission, bit synchronization, character synchronization, character synchronization, synchronous transmission, asynchronous transmission, efficiency of transmission, error detection methods and data compression. Protocols: Introduction to network protocol. Seven Layer ISO-OSI standard protocols and network architecture. Transport protocols, session services protocols, and other protocols. Institute of Electrical and Electronics Engineering 802 standards. Error control and Data Compression: Forward Error Control; detection methods; parity checking; linear block codes, cyclic redundancy checking; feedback error control, data compression, Huffman coding and dynamic Huffman coding. Local Area Networks: medium access control techniques - Ethernet, token bus and token ring; LAN standards; fibre distributed data interface, metropolitan area network. Peer-to-peer, Client Server. Client-Server Requirements: GUI design standards, interface independence, platform independence, transaction processing, connectivity, reliability, backup and recovery mechanisms. Information Network

Software; Features and benefits of major recovery mechanisms. Information Network Software: features and benefits of major Network Operating Systems. Network OS: (e.g. Novell NetWare, UNIX/LINUX, OS/2 & Windows NT). TCP/IP and Network OS. INTERNET: Definition, architecture, services, Internet addressing. Internet protocol, IPv4, IPv6. Internet programming, Intranet. System administration, and security issues.

ICT 407 Information System Analysis & Design (2 Units: LH 30)

System Development Life Circle: Strategy and planning system analysis, logical design, Physical design, implementation maintenance. System Development Techniques and methodologies: by Process modelling, function decomposition diagramming, Entity-Relationship diagramming, data flow diagramming, and procedure modelling. Design and Layout of forms, screens, dialogues, and report. Integrated CASE tool e.g. Oracle Designer to be used for the system development life circle. RAD tools e.g. power Builder, Power Objects visual Basic, IntraBuilder or C++ Builder for concepts and techniques visualization.

ICT 408 Mobile Communication & Network (3 Units: LH 45)

Evolution of mobile radio communications. Examples of mobile radio systems: radiopaging, cordless telephones, cellular radio. Trends in cellular radio and personal communications. A basic cellular system, Frequency reuse, Roaming, Hand-off strategies, Co-channel interference, Traffic and Grade of service, System capacity, Improving capacity of cellular system. Propagation path loss, multi-path propagation problem, Raleigh fading, Rician distribution. Doppler effect. Field strength prediction models, cochannel interference and reduction, adjacent channel interference, near-far problem. Standards and overview of analogue and digital cellular systems: AMPS, TAGS, GSM, CT2, PCN, DECT, PHS. Frequency management and channel assignment, speech coding, channel coding, bandwidth consideration, equalization, modulation techniques, multiple access techniques. GSM: Architecture, elements, and standard interfaces; FDMA/TDMA structure; Speech and channel coding; time slots and bursts; signalling; hand-offs; DCS1800; GPRS; data services over GSM. Third Generation Wireless Standard: convergence; UMTS; IMT-2000; CDMA2000; WCDMA; UWC-136; Network, layer standards. Paging services and technologies; Short Message Services. Call Processing: Signalling; Roaming and mobility management; Route optimization; Wireless Intelligent Networking; Databases; Protocols; Security and billing issues. Global Positioning System: principles, and applications.

ICT 503 JAVA Technology & Programming (2 Units: LH 30)

Java programming: Java basics, Java Applets and Applications, decisions and repetitions, arrays and strings, methods and parameters. Objects and classes, encapsulation and data hiding, data abstraction and abstract data types (ADTs), inheritance, polymorphism, abstract classes and design principles, java.awt and java.awt event packages, buttons, labels, lists, text fields and panels, mouse events and keyboard events, scrollbars and layout managers. Basics of Java exception handling, try blocks, throwing an exception, tatching an exception, throws clause, constructors, fmalisers and exception handling, exceptions and inheritance, finally block. Thread methods, thread states, thread priorities and thread scheduling, thread synchronization, daemon threads, runnable interface, thread groups. Multimedia Applications: Loading, Displaying and Scaling Images, Introduction to Animation, Graphics Double Buffering, Media Tracker, Loading and Playing Audio Clips, Customizing Applets, Image Maps. Network programming: Introduction, Manipulating URLS, Establishing a Simple Server, Establishing a Simple Client Client/Server Interactions, Security and the Network.

ICT 504 Software Engineering (3 Units: LH 45)

Development of methodologies useful in the software engineering classical life cycle. This includes: requirements, design, implementation, and testing phases. These methodologies are reinforced through utilization of a CASE tool and a group project.

ICT 505 Artificial Neural Network (2 Units: LH 30)

Neural Network: Definition of artificial neutral network. Similarities of neural network with human brain. Classification of ANN. Terminologies: input/output sets, weights, bias or threshold, supervised learning, network training, Convergence process, single layer vs. multilayer perception, forward and Backward propagation, gradient descent rule. Back-propagation neural network, Variable term used in back propagation neural network: learning rate, momentum, hidden nodes, sigmoid activation function. Back propagation algorithm of ANN. Design of ANN model, training sets for ANN, test sets for ANN, network testing and performance. Engineering applications. ANN programming.

ICT 507 Introduction to Enterprise Resource Planning Systems (3 Units: LH 45)

This course provides a technical overview of Enterprise Resource Planning Systems and their impact on organizations. Existing software package, such as SAP, should be used to illustrate the concepts, fundamentals, framework, general information technology context, the technological infrastructure, and integration of business enterprise-wide applications.

ICT 508 Antenna & Propagation (3 Units: LH 45)

Antenna Systems: Review of Maxwell's equations. Polarization, polar diagrams, antenna gain, directivity, radiation resistance, impedance matching, effective length and capture area. Radiation by dynamic currents and charges, retarded potentials, the isotrope. Hertzian dipole, short and loop antenna, folded dipole antenna. Vertical and horizontal antennas, rhombic antenna, log-periodic antenna. Centre-fed linear antenna, linear arrays, radiation from diffraction gratings, Yagi-Uda arrays, integrated antennas. Microwave antenna, horn, parabolic reflectors, slot, lenses. Field analysis of antennas. Transmitting-receiving system, reciprocity relations. Equivalent circuit of receiving antenna. Radar Systems: Principles of pulse radar and Doppler radar. Radar equation and system parameters. Components of radar systems. Study of a practical radar system. Radar signal detection. Synthetic aperture radar tracking and scanning HF (OTR) radar. Radio Wave Propagation: Electromagnetic waves, wavefront, characteristic impedance of free space, reflection, refraction and diffraction. Ground waves and sky waves. The ionospheric layers, refractive index, virtual height, critical frequency and angle, maximum usable frequency, skip zone, skip distance, fading. VHF line of sight transmission. Tropospheric scattering communications. Relationship between transmitter power, antenna gains and received signal to noise in a free space radio link. VHF and microwave point-to-point link.

ICT 509 Computer Graphics & Animations (3 Units: LH 45)

Overview of 3D animation and its application and types. Coordinate system, vertex, faces and object. Concept of wireframe, surface and solid modelling. Construction planes and differences between object space and world space. Principles of making characters alive. Polygonal Modeling techniques: the Box, using Edit Mesh, Smoothing Techniques, Subdivision Surfaces. Nurbs Modelling techniques: Utilizing NURBS toolbox, surface points and CVs. Importing and attaching NURBS surfaces, rebuilding surfaces, curve and surface approximation. Graphic animation process: Camera & Animation Camera, Set & Background (Image Plane), Light Linking. Animation Techniques: Walk Cycle and Facial Expression using Blend Shape. Dynamics animation: Rigid Bodies, Soft Bodies, constraint, Particles. Tips and tricks on rendering. Concept of Rendering in 3D modelling. Render options and file output.

ICT 513 Project Management (2 Units: LH 30)

Management Concepts. Project organization, teams, methods and tools for project management. Organization constraints on development. Project Planning Objectives,

Resources, Project Estimation, Cost Factors, Decomposition Techniques, Estimation Models. Risk Strategics, Risk Identification, Risk Projection, Risk Monitoring and Management. Work Breakdown Structure, Task Allocation/Effort Distribution. Network Diagrams, PERT and Critical Path Method, Gantt Chart. Scheduling Strategics. Project Tracking, Controlling Progress. Quality measurement. Linear Programming and PERT/CPM applications. System Engineering, Software Development Process, Software Life Cycle, Software Metrics and Measurement.

ICT 515 Multimedia Technology & Programming (2 Units: LH 30)

Introduction Multimedia state-of-the art, impact of multimedia, technology, and applications.Multimedia Components: Text, data, audio, image, video. Text: Text compression and decompression. Text coding and decoding. Multi-languages. Unicode. Data: Framing of data. Segmentation of data frames. Data formats, data encryption, data recovery, data representation and manipulation. Audio: Audio creation and encoding. Audio recording format, mono and stereo. Audio compression. Real-time audio. Audio streaming technique. Voice recognition. Image: Image formats, image colour scheme, image enhancement, image processing techniques, image compression, scale of compression, multiple images, animation. Video: Video recording formats and standards, resolution, compression, video streaming techniques. image compression, compression, of compression, multiple images, animation. Video: Video recording formats and standards, resolution compression, video streaming techniques. Multimedia Systemsintegration, storing and presentation of multimedia. Comparison of analogue and digital recording. System integration and coordination. Real-time recording and transmission. Error recovery. Video conferencing systems: configuration, functions, transmission, technology. Multimedia over the networks: Hypertext: concepts. Hypertext Markup Language (HTML). HTML programming and multimedia document design. An introduction to XML. Uniform Resource Locators (URL). Protocols: HTTP, FTP, SMTP. Common Gateway Interface (CGI) processing. MIME specification. Script language. Platform independent language, bytecode and interpreter. Multimedia application over the Intranet and the Internet.

ICT 516 Random Processes & Queue Theory (2 Units: LH 30)

Review of probability: Basic concepts. Conditional and total probability. Distribution and density functions. Random variables: single and multiple variables. Mean variance and moments. Basic concepts, definition, and classification of random processes. Stationary process and independence property. Autocorrelation and correlation functions. Ergodicity. Power density spectrum. Linear systems. Hilbert Transforms. Noise modelling. Linear system response to random signal. Narrowband, bandlimited and bandpass processes.

Optimum linear systems: matched filter for white noise and coloured noise, Wiener filters, minimum mean-squared error. Optimization by parameter selection. Poisson points and renewals. Queuing theory. Shot noise. Markov processes. Applications of random signal theory in communications: AM system and noise performance, FM system and noise performance, noise in a phase-locked loop, radar detection: false alarm probability and threshold detection probability.

ICT 517 Data Structures & Algorithm (2 Units: LH 45)

Data Types and ADT: Data types, Arrays & Pointers, Data structures, ADTs & implementation, objects classes. Programming language support for ADTs. Data Structures: stacks: implementation & linked stacks. Recursion: Backtracking & Look-Ahead. Queues: circular, linked. Polynomial arithmetic. List & strings. Searching and Sorting: "Big O" notation. Sequential search, binary search, comparison trees, Insertion sorts, election sort, shell sort, quicksort, mergesort, Radix sort &Heapsort. Hashing. Analysis of these searching and sorting techniques. Trees: Binary trees Traversal of binary tree. Binary search trees: Insertion and deletion & building binary trees Height balance. Multiway trees. Polish Notation, Graph ADT, Graph traversal, first & breadth first algorithms. Shortest Paths, best-first, uniform-cost traversals

ICT 513 Design & Installation of Electrical & ICT service (3 Units: LH 30)

Electrical Installation: Induction to health and safety at work act in Nigeria. Electrical safety. First aid. Electricity supply regulations lighting and Illuminations: Luminous Intensity and flux. Maintenance factor. Coefficient of utilization. Types of light sources. Calculation of lighting requirements. Glare. Stroboscopic effect. Installation Materials, cables, junction box, terminations, joints. Conduits and conducting. Truck and trucking. Electrical Installation design in domestic, commercial and industry. Alarm and emergency systems. Earthling and Protection. Purposes of earthing. Faraday cage. Rod electrodes. Earth electrode resistance. Earthing system. Earth fault loop impedance. ICT services: NCC and FCC codes of practice and standards. Telecommunication design and installation: Satellite, VSAT, etc. Telephone design and installation. Computer networking design and installation. Wireless LAN design and installation. Preparation of Bill of Engineering Measurement Evaluation. Contract bidding. Consultancy.