INFORMATION TECHNOLOGY ENGINEERING

PAPER I

Unit 1: Digital Electronics

1. Introduction
   - Basic difference between analog and digital signal.
   - Applications and advantage of analog & digital signals.

2. Number System
   - Binary and hexadecimal system,
   - Conversion from decimal and hexadecimal to binary and vice versa.
   - Binary addition, subtraction, multiplication and division including binary points.

3. Logic Gates
   - Concept of negative and positive logic
   - Definition, symbols and truth tables of NOT, AND, OR, NAND, EXOR Gates, NAND and NOR as universal gates.

4. Logic Simplification
   - Postulates of Boolean algebra, DE Morgan Theorems, and Various identities.
   - Formulation of truth table and Boolean equation for simple problem.

Unit 2: Networks and Network Security

1. Network Basics

   - What is network, Models of network computing, Networking models, Peer-to-peer Network, Server Client Network, LAN, MAN and WAN, Network Services and Topologies
   - Internet Basics Specification and technical details for establishing Internet. Types and functions of modems, IP addressing, internet domains, domain name server, TCP/IP protocols, Internet service providers, Intranets, Internet Connectivity.

2. Introduction to TCP/IP, Network Architecture and Network Connectivity

   - Concept of physical and logical addressing, Different classes of lP addressing, special IP address. Sub netting and super netting, Loop back concept, IPV4 packet Format, Need of IPV6.
   - Basic Concepts of Media Connectivity (Leased lines, ICDN, PSTN, RF, VSAT, Optical and IPLC)
   - ARC net specifications, Ethernet Specification and Standardization: 10 mbps (Traditional Ethernet), 10 mbps (Fast Ethernet) and 1000.mbps (Gigabit Ethernet)
   - Network connectivity Devices, NICs, Hubs, Repeaters, Multiplexers, Modems, Routers and Protocols, Firewall, ATM, VOIP and Net-to-Phone Telephony, Laws and Protocols.

- Error Detection: - Source of errors in data communication. Effect of errors, data error rate and its dependency on data transfer rates. Error detection through parity bit, block parity to detect double errors and correct single errors.
- General principles of error detection and correction using cyclic redundancy checks.
- Basics of Wireless Networks: - Wireless MAN, Networking, Wireless LAN, Wi-Fi, WiMax and Broadband wireless and Bluetooth technology.

3. Network Security

- Introduction to security attacks, services and mechanism, introduction to cryptography, conventional encryption model, stereography.
- Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS.
- Digital Signatures, authentication protocols.
- Ip-Security: -Architecture, Authentication header, Encapsulating security payloads, key management.
- Web Security: -Secure socket layer and transport layer security, Secure Electronic Transaction (SET).
- System Security: - Intruders, Viruses and related threads, firewall design principles.

Unit 3: Operating Systems

- Elementary concepts in operating System, textual Vs. GUI Interface, Introduction to DOS, MS Office Tools MS WORD, MS EXCEL, MS Power Point.
- Basic DOS Commands
- Overview of an operating system: Software organization, linking, loading and executing control program for batch processing, time sharing and real time O.S. multi programme, multi-processing systems. Various functions of operating System.
- Overview of system software: Compilers, assemblers and loaders
- UNIX Operating system: Feature of UNIX, directory structure of UNIX, File structure of UNIX, concept of inodes. Logging into UNIX, format of UNIX components, basis operations on files, filters and pipelines mail and communication commands.
- Shell programming: Types of shells, control structure for shells and I/O for shells.

Unit 4: Programming and Object Oriented Programming

- Object oriented Paradigm: Structured vs object oriented development, elements of object oriented programming, objects, classes, multiple views, encapsulation and data abstraction, inheritance, polymorphism, object oriented programing (OOP) languages
- Data types, Operators Expressions: Data type such as character, integers etc., variables, operators and expressions

- Control Flow: Statements such as blocks, if statements, if else statement, for loop, while loop, do while loop, switch statement.
- Arrays and Strings: Operators on arrays, multidimensional arrays, strings, arrays of strings, string manipulation
- Classes and Objects: Class specification, class objects, accessing class members, defined member function, passing objects on arguments, returning objects from functions, structures and classes, constructors and destructors.
- Constructors and Destructors: Parameterised constructors, constructor with default arguments
- Operator Overloading: Unary operator overloading, binary operator overloading.
- Inheritance: Derived class declaration, forms of inheritance, constructor and destructor are derived classes.
- Programming Using "C"
  - Steps in development of a program, Flow charts, Algorithm and Program Debugging.
  - Program structure:-I/o statements, assign statements. Constants, variables and data types.
  - Operators and Expressions, Standards and Formatted, Use of Header & Library files.
  - Control structures: Introduction, Decision making with lF-statement, IF-Else and Nested IF, While and do-while, for loop, Break and switch statements.
  - Functions:-Introduction to functions, Global and Local Variables, Function Declaration, standard functions, Parameters and Parameter Passing, Call-by value/reference, Recursion.
  - Introduction to Arrays: Arrays Declaration and Initialization, Single and Multidimensional Array. Arrays of characters.
  - Pointers: - Introduction to Pointers, Address operator and pointers, declaring and Initializing pointers, Assignment through pointers, Pointers and Arrays.
  - Structures and Unions:-Declaration of structures, Accessing structure members, Structure Initialization, Arrays of structures, Unions.
  - Strings:- Introduction, Declaring and Initializing string variables, Reading and writing strings, String handling functions, Array of strings
  - Files: -Introduction, File reading/writing in different modes, File manipulation using standard function types.

- Data Structures Using 'C'
  - Fundamental Notations:-Problem solving concept, top down and bottom up design, structured programming, Concept of data types, variables and constants, concept of pointer variables and constants.
  - Arrays:-Concept of Arrays, Single dimensional array, Two dimensional array storage strategy of multidimensional arrays, operations on arrays with algorithms (searching, traversing, inserting, deleting)
  - Linked Lists:-Introduction to linked list and double linked list, Representation of linked lists in Memory, Traversing a linked list, searching linked list, Insertion and deletion into linked list Application of linked lists,, Doubly linked lists, Traversing a doubly linked lists, Insertion and deletion into doubly linked lists.

- Introduction to stacks, Representation of stacks, Implementation of stacks, uses of stacks, Introduction to queues, Implementation of queues (with algorithm), Circular Queues, De-queues, Recursion.
- Binary search trees Traversing Binary Trees (Pre order, Post order and In order), searching, inserting and deleting binary-search trees.
- Sorting and Searching: - Introduction, Search algorithm (Linear and Binary), Sorting algorithms (Bubble sort, Insertion sort, Quick sort, Selection Sort, Merge Sort, Heap Sort).

- Visual Basic and .Net
  - Introduction, common Language Runtime, common Type system, common Language Specification, The Base class Library, The .NET class library intermediate language, Just-in-Time compilation, garbage collection, Application installation & Assemblies.
  - The start Page, Menu and Tool Bar, Toolbox, Solution Explorer, Class View Window, Properties Window, Task List and output Window, server Explorer, keywords, statements, variables, Data types, operators, Decisions with if, switch statements, using Loops, Arrays.
  - Procedures in VB .Net, Class and objects, Error Handling, working with Textbox, Button, Labels, Checkbox, Radio Buttons, List box, Combo Box, Picture Box. Menu.
  - ADo.NET Data Namespaces, SQL Connection, SQL Command, SQL Data Adapter, Dataset class, Data Binding, Data View.
  - Windows Services, Web Services, Web Forms.

Paper- II

Unit 5: Database Management Systems

- Purpose of database, data abstraction, data models, instances & schemas, data independence, data definition language, data manipulation language.
- Classification of DBMS Users:
  - Actors on the scene: Database Administrators, Database Designers, End Users, System Analysts and Application Developers and Programmers.
  - Workers behind the Scene: DBMS system designers and implementers, tool developers, operators and maintenance personnel.
- Entity & Entity sets, relationship sets, mapping constraints, candidate & primary key, entity relationship diagram, reducing ER diagram to tables.
- Relational Model: Concepts of relational model, integrity constraints, extension & intension, relational algebra, relational calculus, commercial query language, modifying the database, comments on relational model.
- DBMS based Relational Model: Introduction, the mapping operation, data manipulation facility, data definition facility, data control facility.
- Normalisation: Introduction to functional dependence, normalization 1NF, 2NF, 3NF, BCNF, 4NF, 5NF
- Oracle, Sybase or Ingress: Creation of tables, modification of tables, DDL command for RDBMS, SQL command for RDBMS

Unit 6: The Internet and E-commerce

- World Wide Web and its evolution, webpage, webserver, HTTP protocol. Examples of web servers. Navigation Tools like Netscape and Internet Explorer to surf the Internet, Uniform Resource Locator (URL). Hypertext, hyperlinks and hypermedia, URL, its registration, browsers, search engines, proxy servers.
- Internet Security: Basics of authentication and authorization, Introduction to firewall, viruses, worms, bombs and protective measure, various techniques of encryption and decryption, SSL (Secure Socket Layer).
- Internet Applications: E-mail, Telnet, FTP, IRC, NNTP, Video conferencing, e-commerce.
- E-Commerce Applications: ecommerce banking, online shopping, business, models, and revenue models, online publishing, ecommerce, in retail industry, CBS, digital copy rights, electronic data interchange, secure electronic fund transfer, "electronic display board, electronic catalogue, public and private key encryption, concepts of digital signature and digital certificate.
    - Electronic payments systems: digital cash, electronic signature, debit cards at point of scale, smart cards, online, credit cards, based systems, electronic fund EFT, and payment gateways.
    - Architectural framework of ecommerce web architecture, web browser, HTTP, TCP/IP, webserver, HTML, CGI, scripts standards: EDIFACT

Unit 7: Software Engineering

- Introduction to software engineering, Importance of software, The evolving role of software, Software Characteristics, Software Components, Software Application, Software Crisis, Software engineering problems, Software Development Life Cycle, Software Process.
- Analysis Principles, Water Fall Model, The Incremental Model, Prototyping, Spiral Mode, role of management in software development. Design principles, problem partitioning, abstraction, and top down and bottom up-design, structured approach, functional versus object oriented approach, Cohesion, Coupling, Fourth generation techniques.
- Top Down and Bottom -Up programming, structured programming, information hiding, programming style and internal documentation.
- Testing principles, Levels of testing, Testing Life cycle, functional testing, structural testing, test plane, test case specification, Verification & validation, Unit testing, Integration Testing, Alpha & Beta testing, system testing and debugging.
- Reliability issues, Reliability metrics, Reliability growth modelling, Software quality, ISO 9000 certification for software industry, SEI capability maturity model, comparison between ISO & SEI CMM. CASE and its Scope, CASE support in software life cycle, documentation, project management, Reverse Software Engineering, Architecture of CASE environment.

Unit 8: Maintenance and Facility Management

- Site Preparation: Design of computer room, specification for flooring materials, false roofing, disk tape library room, air conditioning requirements and its maintenance. Temperature and humidity factor, need for dust proofing, different types of air conditioners and their application, Design of computer, power requirement of computer room, Need of stabilizer, CVT, UPS, simple principle of UPS and its advantages over normal power supply, earthing and its advantages, distribution board, fire detection and prevention of computer room
- Installation: Layout planning of computer system, knowledge of installation procedure and manuals, cracking offline equipment, act-all testing computer system, using manufacture specified procedure, training the operator for small system like Pc, Installation of various kinds of printers. Installation of hubs and switches, installation of network cable, fibre optic and UTP cabling.
- Maintenance : Types of maintenance, preventive and corrective maintenance, site audit, importance of preventive maintenance, Use of diagnostic software like Pc tools, QA++, Norton commander, Macaceffe, Smartdog, Typical symptoms of common hardware and software fault and understand the error messages some aid to chip level fault detection and its rectification, failure of equipment, knowledge of local parts substitution.
- Maintenance of printers
- Storage Management: Backup & Storage, Archive & Retrieve, Disaster Recovery, Space Management, Database & Application Protection, Bare Machine Recovery, Data Retention.
- Security Management: Security, Computer and internet Security, Physical Security, Identity Management, Access Management. Intrusion Detection, Security Information Management
- IT Ethics: Introduction to Cyber Ethics, Intellectual Property, Privacy and Law, Computer Forensics, Ethics and Internet, Cyber Crimes
- Emerging Trends in IT: Electronics Commerce, Electronic Data Interchange, Mobile Communication Development, Smart Card, Expert Systems.