PLAN OF EXAMINATION

1. The Examination shall be conducted according to the following plan:-

Part I—The details of the written examination i.e. subject, duration and maximum marks allotted to each subject are given in para 2 below.
Part-II—Personality test carrying a maximum of 100 marks of such of the candidates who qualify on the basis of the written examination.

2. The following will be the subjects for the written examination:-

CATEGORY I
CIVIL ENGINEERING

	Subject	Duration	Maximum Marks
1	General English	2 Hrs	150
2	General Studies	2 Hrs	150
3	Civil Engineering (Paper-I)	3 Hrs	300
4	Civil Engineering (Paper-II)	3 Hrs	300
	Total		**900**

CATEGORY II
ELECTRICAL ENGINEERING

	Subject	Duration	Maximum Marks
1	General English	2 Hrs	150
2	General Studies	2 Hrs	150
3	Electrical Engineering (Paper-I)	3 Hrs	300
4	Electrical Engineering (Paper-II)	3 Hrs	300
	Total		**900**

CATEGORY III
INFORMATION TECHNOLOGY ENGINEERING

	Subject	Duration	Maximum Marks
1	General English	2 Hrs	150
2	General Studies	2 Hrs	150
3	Information Technology Engineering (Paper-I)	3 Hrs	300
4	Information Technology Engineering (Paper-II)	3 Hrs	300
	Total		**900**

3. In the Personality Test special attention will be paid to assessing the candidate's capacity for leadership, initiative and intellectual curiosity, tact and other social qualities, mental and physical energy, powers of practical application and integrity of character.

4. All written papers must be in English. Question Papers will be set in English only.

5. Candidates must write the papers in their own hand. In no circumstances will they be allowed the help of a scribe to write the answers for them.

6. The Manipur Public Service Commission shall have discretion to fix qualifying marks in any or all the subjects of the examination.

7. Marks will not be allotted for mere superficial knowledge.

8. In the question papers, wherever required, SI units will be used.

9. Candidates will be permitted to bring and use battery operated pocket calculators for conventional (essay) type papers only. Loaning or inter-changing of calculators in the EXAMINATION HALL will not be permitted. Candidates will be not permitted to use calculators for answering Objective Type Paper (Test Booklets). They should not, therefore, bring the same inside the Examination Hall.

10. Candidates should use only International form of Indian numerals (e.g. 1, 2, 3,4,5,6 etc.) while answering question papers.

The standard of paper in General Ability Test will be such as may be expected of an Engineering/Science Diploma. The standard of papers in other subjects will approximately be that of an Engineering Diploma Examination of an Indian University. There will be no practical examination in any of the subjects.

GENERAL ABILITY TEST

Part A: General English. The question paper in General English will be designed to test the candidate's understanding of English and workmanlike use of words.

Part B: General Studies: The paper in General Studies will include knowledge of current events and of such matters as of everyday observation and experience in their scientific aspects as may be expected of an educated person. The paper will also include questions on History of India and Geography of a nature which candidates should be able to answer without special study.

CIVIL ENGINEERING
(Conventional type papers)

PAPER-I

1. BUILDING MATERIALS

Timber : Different types and species of structural timber, density-moisture relationships, strength in different directions, defects, influence of defects on permissible stress, preservation, dry and wet rots, codal provisions for design, plywood.

Bricks: Types, Indian Standard classification, absorption, saturation factor, strength in masonry, influence of morter strength on masonry strength.

Cement: Compounds of different types, setting times, strength.

Cement Mortar: Ingredients, proportions, water demand, mortars for plastering and masonry.

Concrete: Importance of water cement Ratio, Strength, ingredients including admixtures, workability, testing for strength, elasticity, non-destructive testing, mix design methods.

2. CONSTRUCTION TECHNOLOGY AND EQUIPMENT:

Concept of foundations, types of foundations: Brick masonry, Types of brick bonds: Doors and windows, types and uses: Damp proofing – its effect on bricks, plaster, wood fixtures; Roofs – Types: Stairs-Planning and layout, types of stairs.

Concreting Equipment:
Weight Batcher, Mixer, vibrator, batching plant, concrete pump. Cranes, hoists, lifting equipment.

Earthwork Equipment:
Power shovel, hoe, dozer, dumper, trail waves and tractor, roller, sheep foot rollers, pumps.

3. ESTIMATING

Units of measurements, method of calculating quantity of earth. Lead and lift, types of estimates: Specification of earth work in excavation, first class brick work, wood work in doors and windows, construction of cement concrete floor, white washing, and RCC work: Calculation of quantities of cement concrete work.

4. HYDRAULICS AND HYDRAULIC MACHINES

Fluid Properties, Pressure, Thrust, Buoyancy; Flow Kinematics; Integration of flow equations; Flow measurement; Viscosity, Hydraulic Jump, pipe flow, losses in pipe flows, water hammer.

Pumps – Centrifugal pumps, Reciprocating pumps. Hydraulics Ram, Hydraulic turbine and its types.

5. SOIL MECHANICS

Properties of soil, classification and interrelationship; Compaction behaviour, methods of compaction and their choice; Permeability and seepage, flow nets, Compressibility and consolidations, Shearing resistance, stresses and failure; Soil testing in laboratory and in-situ; Stress path and applications, Earth pressure theories, stress distribution in soil; soil exploration, samplers, load test, penetration test.

6. SURVEYING

Classification of surveys, Scales, Accuracy, Measurement of distances – direct and indirect method; Measurement of direction, Prismatic compass, Local Attraction, Theodolites – types, Measurement of elevation – levelling; Contours; tachometry surveying, plane table surveying. Definition of curves, relation between degree of curves and its radius, types of curves, elements of circular curve.

Paper-II

1. SOLID MECHANICS

Elastic constants, stress, plane stress, Mohr's circle of stress, strains, plane strain, Mohr's circle of strain, combined stress; Elastic theories of failure; Simple bending, shear; Torsion of circular and rectangular sections and simple members.

Shear force and bending moment, Direct and bending stresses, Framed Structures, Deflection of beams.

2. DESIGN OF STEEL STRUCTURES

Design of riveted and welded connections, tension and compressive members.

3. DESIGN OF CONCRETE AND MASONRY STRUCTURES

Limit state design for bending, shear, axial compression and simple column footing. Codal provisions for slabs, beams, walls and floorings. Working stress method of design of R.C. members. Merits and demerit of limit state and working stress method of design.

4. IRRIGATION ENGINEERING:

Hydrology, Hydrological cycle, precipitation and related data analyses, Unit hydrograph; Evaporation and transpiration; Floods and their management; Streams and their gauging; Capacity of Reservoirs.

Water resources of the globe, Multipurpose uses of Water: Soil-Plant-Water relationships, irrigation systems, water demand assessment; Storages and their yields, ground water yield and well hydraulics; Water logging; lining of canals; Sediment transport in canals, Non Overflow and overflow sections of gravity dam and their design concept, Energy dissipaters, distribution works, falls, cross drainage works, outlets; River training.

5. ENVIRONMENTAL ENGINEERING:

(A) WATER SUPPLY ENGINEERING:

Sources of water supply, yields; Estimation of demand; Water quality standards; Control of Water-borne diseases; Primary and secondary treatment, detailing and maintenance of treatment units; Conveyance and distribution systems of treated water, Leakages and control; Rural water supply; Institutional and industrial water supply.

(B) WASTE WATER ENGINEERING

Urban water disposal; Systems of sewage collection and disposal; pumping Characteristics of sewage and its treatment, Disposal of products of sewage treatment, stream flow rejuvenation, Institutional and industrial sewage management; Plumbing systems; Rural and semi-urban sanitation.

(C) SOLID WASTE MANAGEMENT
Source, classification collection and disposal; Design and Management of landfills.

(D) AIR AND NOISE POLLUTION AND ECOLOGY
Sources and effects of air pollution, monitoring of air pollution; Noise pollution and standards; Ecological chain and balance, Environmental assessment.

6. TRANSPORTATION ENGINEERING

Planning of highways systems, alignment and geometric design, horizontal and vertical curves, grade separation, materials and construction methods for different surfaces and maintenance: Principles of pavement design: Drainage.

Traffic surveys, intersection, signalling, tunnelling, alignment, method of construction, drainage, lightning and ventilation.

ELECTRICAL ENGINEERING
(Conventional type papers)

PAPER I

1. ELECTRO-MAGNETIC CIRCUIT

Electric and magnetic fields, terms related to magnetic circuit, Comparison between electric and magnetic circuits and related simple problem, conductors and magnetic materials.

2. ELECTRIC MATERIALS

Conductors, Semi-Conductors & Insulators, Super Conductivity, Insulating materials for electrical & their applications, Magnetic materials, Ferro, Para, diamagnetic, ceramics, properties and application, special semi-conductors.

3. ELECTRICAL CIRCUITS (AC & DC CIRCUITS)

Circuits elements, Network Theorem:- Kirchhoff's Law, Thevenin's Theorem & Superposition Theorem, R-L-C Series & Parallel Circuits, Series & Parallel Resonant circuits, 3-phase circuits, Star Delta conversion and simple problems.

4. ELECTRIC MEASUREMENT & MEASURING INSTRUMENTS:

Units & standards:-
Indicating instruments-ammeter, voltmeter, wattmeter & energy meter. Measurement of power, resistance (low, medium & high) & transducer.

Bridge measurement:
D.C. Bridge-Wheatstone Bridge & Kelvin Bridge

A.C. Bridge-Anderson Bridge, Maxwell Bridge & Wein's Bridge.

A.C. & D.C. Potentiometer & Localisation of cable fault (Loop Test), High voltage measurement.

5. PROTECTIVE DEVICES:
Types of Relay – Over current, Over voltage, Distance, Directional & Differential.
Types of Circuit Breakers – Oil C.B., Air C.B., Vacuum & Gas C.B.
Types of Lightening Arrester – Horn-gap Arrester, Thyrite Arrester, Valve type Arrester & Pellet type Oxide film Arrester.
Types of Insulators-Pin insulator, Strain insulator & Suspension type insulator.

6. BATTERY
Primary & Secondary Cells, Construction of Lead acid Cell, Chemical changes, Application & Maintenance of Lead acid cell & Charging systems (Constant current & constant voltage)

7. ELECTRICAL MACHINES
D.C. Generator: - Construction and different types of generator, E.M.F. Equation, Armature reaction, Commutation, General characteristics and related problems.

D.C. Motor:- Significance of back e.m.f., Derivation of Torque equation, Characteristics of different types of D.C. motors (Series, Shunt & Compound motor), Speed control of D.C. motor (Series & Shunt), Losses & Efficiency and related problems.

8. DIGITAL FUNDAMENTALS
Number system and codes: Binary Number System, Octal Number System, Decimal Number System, Hexadecimal Number System, Conversion of number systems. ASCII Code, Excess-3 Code, Gray Code, EBCDIC Code.
Digital Logic: Basic Gates, Boolean Algebra, Combinational and Universal Gates, Positive and Negative logic.
Combinational Logic Circuits: Boolean Laws and theorems, De-Morgans Theorem, Sum of Products (SOP) and Product of sums (POS), Pairs, Quads, Octets, K-Map.
Data Processing Circuits: Multiplexers and De-Multiplexers, Encoder and Decoders, Parity generators and checkers, Programmable Logic Arrays, Programmable Array Logic.
Arithmetic Circuits: Binary addition and subtraction, Signed and un-signed magnitude numbers, 1's and 2's complement, 9's and 10's complement, Adder and subtractor circuits.
Flip Flops: RS, JK, Gates, Edge triggered flip-flops, JK Master-Slave flip-flop.

Registers: Types of Registers, Serial In-Serial Out, Serial In-Parallel Out, Ring Counters.

Counters. Asynchronous and Synchronous Counters, Decade counters, Modules counters.

Memory: Basic terms and concepts, Magnetic and semiconductor memories, Memory addressing.

Paper-II

1. ELECTRICAL MACHINES

Transformer: Construction of different types of transformers, e.m.f. Equation, Equivalent circuit, Vector diagrams and No load & load condition, Short circuit & Open circuit test, Losses & Efficiency, Auto-transformer, Different connections of 3 phase Transformer like star-star, delta-delta, delta-star & star-delta and related problems.

Synchronous Motor: Principle of operation, Starting methods, effects of excitation on armature current & power factor, Construction of V-curve & inverted V-curve, Vector diagram and related problems.

3-phase induction motor: Description of its component, Relation between supply frequency, slip & rotor frequency, Torque equation, condition of maximum torque, Power stages, Starting & Speed control and related problems.

1-phase motor:
Single phase induction motor: Different types, starting method, double field revolving theory.
Shaded pole motor, Universal motor, Repulsion motor & A.C. Series motor.

Alternator Or AC Generator: Construction, Pitch factor, Breadth factor, Equation of induced emf, leakage reactance, Synchronous reactance, Vector diagram, Voltage regulation & its determination by Synchronous impedance method and related problems.

2. POWER SYSTEM:

Power Generating Stations: Hydro, Thermal & Nuclear.
Tariff: Tariff & Economic consideration, operating factor, Power factor improvement & Related problems.
Transmission Lines: Transmission line (Short, Medium & Long), Voltage regulation & Transmission efficiency and related problems.
Distribution Lines: Types of distributors (radial & ring main), Inter connected system and related problems.

3. SUB-STATION:

Different types & Components of Sub-station, Bus-bar arrangement, Types & laying method of Underground Cables and Types of Earthing.

4. CONTROL SYSTEM:

Mathematical modelling of physical system, Block diagrams open and closed loop control system & their reduction.

5. ELECTRONIC DEVICES AND CIRCUITS

Fundamental of Electronics: Definition and field of application of electronics. Types of electronics components – active, passive, symbols, colour codes and uses.

Basic semiconductor Theory: Atomic structure, valency and energy levels, energy band diagrams of insulators, conductors and semiconductors, Definition and types of semiconductors, Doping, Intrinsic and extrinsic semiconductors, P and N type semiconductors.

PN Junction Theory: PN Junction Diode, formation of electrons and holes and the effect of temperature, forward and reverse bias, volt ampere characteristics, LED, Photodiode, Zener diode and their applications.

Rectifier and filters: Rectifier circuits – Half wave, full wave, center trapped and bridge rectifiers, Simple filter circuits-C, LC and CLC.

Junctions Transistors: Junction transistors construction, types, symbols, principle of operation and field of applications, Biasing transistor in active, saturation and cut-off region, Fixed bias and potential divider, Types of configuration – CB, CE and CC, their output characteristics, Current amplification factors – alpha, beta and relationship between them.

Transistor Amplifiers: Basic CB, CE amplifiers – graphical analysis and load lines, RC coupled amplifier – frequency response, upper and lower cut-off and bandwidth, Multistage Amplifiers – Class A, B, AB and C tuned voltage amplifiers.

Feedback Amplifier and Oscillators: Principle of feedback and types of feedback, Barkhausen Criterion, RC phase shift, Wienbridge, Hartley, Colpitt and Crystal oscillators.

Special electronic devices: Construction symbols and characteristics of JFET, MOFET, UJT DIAC, TRIAX and SCR.

Operational Amplifiers (OPAMP-741C): Differential amplifier, Differentiator, Integrator, Characteristics of OPAMP.

IC 555 Timer Counter: Multivibrators – Astable, Monostable and Bi-stable.

6. MICROPROCESSOR AND ITS APPLICATIONS

Introduction: Evolution of microprocessor, evolution of microcomputer, Components of a computer (digital), Buses and memory addressing capacity of CPU.

Microprocessor Architecture of 8085: ALU, Timing and control unit, Registers, Address and data buses, Pin configuration, Opcode and operand, Instruction cycle and data flow, Timing diagram.

Instruction Set of 8085: Instruction and data formats, Addressing modes, Status flags, Instructions and types, Various languages, Stack and subroutines, Programs.

Peripheral Devices and their interfacing: Address space partitioning, Memory and input output interfacing, Data transfer schemes, Interrupts of 8085,

Interfacing devices and input output devices, Programmable peripherals interface (8255), 8253, 8257, 8279.

INFORMATION TECHNOLOGY ENGINEERING
(Conventional type papers)

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 IP 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 block, 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"
  - o Steps in development of a program, Flow charts, Algorithm and Program Debugging.
  - o Program structure:-I/o statements, assign statements. Constants, variables and data types.
  - o Operators and Expressions, Standards and Formatted, Use of Header & Library files.
  - o Control structures: Introduction, Decision making with lF-statement, IF-Else and Nested IF, While and do-while, for loop, Break and switch statements.
  - o Functions:-Introduction to functions, Global and Local Variables, Function Declaration, standard functions, Parameters and Parameter Passing, Call-by value/reference, Recursion.
  - o Introduction to Arrays: Arrays Declaration and Initialization, Single and Multidimensional Array. Arrays of characters.
  - o Pointers: - Introduction to Pointers, Address operator and pointers, declaring and Initializing pointers, Assignment through pointers, Pointers and Arrays.
  - o Structures and Unions:-Declaration of structures, Accessing structure members, Structure Initialization, Arrays of structures, Unions.
  - o Strings:- Introduction, Declaring and Initializing string variables, Reading and writing strings, String handling functions, Array of strings
  - o Files: -Introduction, File reading/writing in different modes, File manipulation using standard function types.

- ➢ Data Structures Using 'C'

- o 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.
- o Arrays:-Concept of Arrays, Single dimensional array, Two dimensional array storage strategy of multidimensional arrays, operations on arrays with algorithms (searching, traversing, inserting, deleting)
- o 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.
- o 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.
- o Binary search trees Traversing Binary Trees (Pre order, Post order and In order), searching, inserting and deleting binary-search trees.
- o 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
  - o 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.
  - o 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.
  - o Procedures in VB .Net, Class and objects, Error Handling, working with Textbox, Button, Labels, Checkbox, Radio Buttons, List box, Combo Box, Picture Box. Menu.
  - o ADo.NET Data Namespaces, SQL Connection, SQL Command, SQL Data Adapter, Dataset class, Data Binding, Data View.
  - o 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:
  - o Actors on the scene: Database Administrators, Database Designers, End Users, System Analysts and Application Developers and Programmers.
  - o 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.
  o 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.
  o Architectural framework of ecommerce web architecture, web browser, HTML, 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.