Civil Engineering

SURVEYING: Principles of Surveying, Linear measurements with tape, corrections, chain surveying, Campass surveying, Plane Table Surveying, types of levels, Principles of levelling, Rise & Fall method, Height of Instrument method, various corrections in levelling. Theodolite surveying, measurement of angle by theodolite, temporary and permanent adjustments of a transit theodolite. Trigonometric levelling. Tachometric surveying.

GEOTECHNICAL ENGINEERING: Index properties of soil, Identification and classification of soils, Intergranular and Pore Water Pressures, Capillary Phenomena Permeability of soil, Seepage through Soils , stress distribution in soil, compaction and consolidation of soils, shear strength of soil, Earth pressure, Bearing capacity of soil, Soil Exploration.

THEORY OF STRUCTURES: Stress and strain, stress-strain relationship and elastic constants, Mohr's circle for plane stress and plane strain, thin cylinders, shear force and bending moment diagrams, bending and shear stresses, deflection of beams, torsion of circular shafts, Euler's theory of columns, strain energy methods, clapyron's three moment theorem, slope deflection method, moment distribution method, redundant frames, rolling loads and influence lines, cables and suspension bridges, conjugate beam method.

FLUID MECHANICS: Fluid properties, fluid statics, buoyancy and floatation, control-volume analysis of mass, momentum and energy, differential equations of continuity and momentum, Bernoulli's equation, viscous flow of incompressible fluids, boundary layer, elementary turbulent flow, flow through pipes, head losses in pipes, bends etc, flow through open channels, pumps and turbines.

DESIGN OF R.C.C STRUCTURE: Constituents of concrete and their properties**,** Design Mix concrete, Design of singly and double reinforced beams, T-beams, Cantilever beams using Limit State Method. shear reinforcement, Design of columns and footings, Design of one way slab, two way slab with simply supported and restrained edges. Design of stairs, Retaining Walls, Water Tanks, Design of slab culverts.

DESIGN OF STEEL STRUCTURES: Types and Properties of structural steel, I.S. rolled sections, Design of riveted and welded connections, Design of Tension and compression members, Design of laterally restrained and unrestrained beams, Design of various members of a roof truss and joint bracings, Plate Girder Bridges, components. Pressed Steel Water Tanks with Staging.

HIGHWAY ENGINEERING: History and Classification of Roads. Alignment Design, Highway Location, Route Surveys, Highway Geometric Design, Highway Materials, Traffic Engineering, Hill Roads : Problems of alignment, geometric design requirements and drainage. Highway Pavement Design, Various methods of design of Flexible Pavements, General design consideration of Rigid Pavements, difference between Rigid and Flexible Pavements, Westergaard's Method for design of Rigid Pavements and concept for stresses due

to load and temperature in rigid pavements. Joints in Cement Concrete roads, Highway Drainage.

IRRIGATION & FLOOD CONTROL: Development of Irrigation in India, Advantages of Irrigation, Lift and Flow Irrigation, Water requirement of Crops, Irrigation methods. Design procedure for Irrigation Channels. Water Logging and its control. Lining of Channels. Irrigation Outlets, Types of Semi Modules, Rigid Modules. River Training Methods. Khosla's Theory for determination of pressures and exit gradients, Bligh's creep theory. Regulation Works. Cross Drainage Works. Canal. Gravity and Earthen Dams.

Mechanical Engineering

Engineering Mechanics: Free body diagrams and equilibrium; trusses and frames; virtual work; kinematics and dynamics of particles and of rigid bodies in plane motion, including impulse and momentum (linear and angular) and energy formulations; impact.

Strength of Materials/: Stress and strain, stress-strain relationship and elastic constants, Mohr';s circle for plane stress and plane strain, thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts; Euler';s theory of columns; strain energy methods.

Theory of Machines: Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of slider-crank mechanism; gear trains; flywheels.

Fluid Mechanics: Fluid properties; fluid statics, manometry, buoyancy; control-volume analysis of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli';s equation; viscous flow of incompressible fluids; boundary layer; elementary turbulent flow; flow through pipes, head losses in pipes, bends etc.

Heat-Transfer: Modes of heat transfer; one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins; dimensionless parameters in free and forced convective heat transfer, various correlations for heat transfer in flow over flat plates and through pipes; thermal boundary layer; effect of turbulence; radiative heat transfer, black and grey surfaces, shape factors, network analysis; heat exchanger performance, LMTD and NTU methods.

Thermodynamics: Zeroth, First and Second laws of thermodynamics; thermodynamic system and processes; Carnot cycle. irreversibility and availability; behaviour of ideal and real gases, properties of pure substances, calculation of work and heat in ideal processes; analysis of thermodynamic cycles related to energy conversion

Applications: Power Engineering, Steam Tables, Rankine, Brayton cycles with regeneration and reheat. I.C. Engines: air-standard Otto, Diesel cycles. Refrigeration and air-conditioning: Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle; moist air: psychrometric chart, basic psychrometric processes. Pelton-wheel, Francis and Kaplan turbines - impulse and reaction principles, velocity diagrams.

Production Planning and Control/Operations Research: Forecasting models, aggregate production planning, scheduling, materials requirement planning. **:** Linear programming, simplex and duplex method, transportation, assignment, network flow models, simple queuing models, PERT and CPM

Electrical Engineering

1. NETWORK ANALYSIS & PRINCIPLE OF ELECTRICAL ENGG.

Conventions for describing networks: Reference directions for currents and voltages, conventions for magnetically coupled circuits, circuit topology.

First order differential equation: Differential equations as applied in solving networks, Application of initial conditions, evaluating initial conditions in networks.

Laplace Transformations: Solution of network problems with Laplace transformation, Heavisides Expansion theorem

Wave Form Analysis & Synthesis: The unit set up, ramp and impulse functions and their Laplace transforms, Initial and final value theorems, convolution integral, convolution as summation.

Network Functions-poles and zeroes: Ports or terminal pairs, Network functions for one port and two port networks (ladder and general networks), Poles and Zeros of network functions, Restriction on pole and Zero locations for driving point and transfer functions. Time domain behaviour from pole Zero plot.

Two port parameters: Admittance impedance, transmission and hybrid parameters, Relationship between parameter sets, parallel series & Cascade connection of two port Networks, Characteristics impedance of two port networks.

Filters: Filter fundamentals- pass and stop band, filter classification, constant K & m derived filters, Behaviour of characteristics impedance over pass & stop bands, design of filters.

Network Synthesis:Synthesis problem formulation, properties of positive real functions. Hurwitz polynomials properties of RC, LC and RL driving point, functions. Foster and Cauer synthesis of LC,RL and RC circuits

Electric Circuit Laws & Energy Sources: Basic electric circuit terminology, Ohm's law, Kirchoff's laws, Circuit parameters (Resistance, inductance & capacitance), series & parallel combination of resistance, inductance & capacitance. Ideal & practical voltage and current sources and their transformation. Dependent voltage sources and dependent current sources.

D.C. Circuit Analysis: Power and energy relations, analysis of series parallel D.C. circuits, Star-Delta transformation, Superposition theorem, Mesh & Nodal methods, Thevenin's theorem, Narton's theorem, Maximum power transfer theorem. Reciprocity Theorem

A.C. Circuit: Basic terminology and definition, Average and effective values of periodic functions, instantaneous and average power, Power factor. Phasor and complex number representation.

A.C. Circuit Analysis: Solution of sinusoidally excited R, L, C circuits, Applications of Network theorems to A.C. circuits. Resonance in series and parallel circuits; quality factor.

Steady State A.C. 3-Phase Circuits: Concept of 3-phase voltage, Wye (y) circuits, Delta circuits current and voltage relations in Wye and delta circuits. Measurement of power in three phase balanced circuits.

2. ELECTRICAL MACHINES

Transformers: Principle, Construction and operation of single phase transformer, phasor diagram, equivalent circuit, voltage regulation. Transformers losses and efficiency, Testing- Polarity Test, Open & short circuit tests, Sumpner's test. All day efficiency

Three Phase Transformer: Construction, various types of connection and their comparative features. Parallel operation of single phase and three phase transformers. Rating of transformers.

Autotransformers: Construction, Principle, Applications and Comparison with two winding transformer.Scott connection, Open delta. Cooling of transformers.

D.C. Machines: Working principle, construction and methods of excitation.

Armature Windings: Study of simple lap and wave winding.

D.C. Generators: Emf equation, Armature reaction, Commutation- Causes of bad commutation, Methods of improvement, Effect of brush shift, Compensating winding, Characteristics of various types of generators, applications.

D.C. Motors: Torque equation, Characteristics of d. c. shunt, Series and compound motors, applications.

Starting & Speed Control: Starting methods and speed control of d. c. shunt and series motors.

Testing: Direct and regenerative methods to test d. c. machines.

Induction Machines: Constructional features, principle of operation, Rotor e.m.f., current power, frequency, equivalent circuit, Phasor diagram of induction motor, Losses and efficiency. Torque- Slip characteristics.

Testing of Induction Motor: No load test and blocked rotor test.

Starting, cogging and crawling, Speed control of Induction motors. Applications

Single Phase Induction Motors: Constructional features, Principle of working: cross-field theory and double revolving field theory, equivalent circuit, determination of parameters, starting methods & applications.

Synchronous Machines: Constructional features, Cylindrical rotor machine- Synchronous Generators- Generated e.m.f., phasor diagram, armature reaction, Voltage regulation: synchronous impedance, M.M.F. and Zero power factor method. Hunting, Synchronous Condensor.

Synchronous Motor: Operating principle, phasor diagram, operating characteristics of synchronous machines, V-curves, starting methods of synchronous motors.

Salient pole Machine: Two reaction theory, analysis of phasor diagram, power angle characteristics, determination of X d and Xq.

Parallel operation of Alternators- Synchronization and load division

Commutator Machines: Effect of injected emf in the rotor circuit of 3-phase inductor motor, slip power, constant torque and constant H.P. Drive, Kramer control, Schrage motor construction, principle of operation, characteristics and applications.

Single-phase series motor: torque expression plain series motor (Universal motor), phasor diagram commutation, operation on A.C. and D.C. supplies, Compensated series motor phase diagram and commutation.

3. CONTROL SYSTEMS

Introduction to Linear Control System: Control Systems, types of control systems, feedback and its effects, mathematical modeling of physical systems.

System Representation: Block diagrams, representation of control systems, transfer functions, signal flow graphs, polar and Bode plot representation of loop gains of control systems.

Time Domain Analysis of Control Systems: Time domain analysis of first & 2^{nd} order Control systems. Typical test signals for time response of control systems, time domain performance of first and second order control systems (steady state response and transient response).

Design of Feedback Control Systems: Approaches to system design, phase lead, and phase lag design using Bode-diagram and root locus techniques. Introduction to P,PI and PID controllers.

Analysis of Linear Feedback Systems: Stability characteristic equation, state transition matrix, stability of linear time invariant systems, Rough-Hurwitz stability Criterion, Root locus plot, Bode plot, Niquest Criterion.

Frequency Domain Analysis of Control Systems: Frequency domain characteristics second order systems relative stability, graphic methods of determining gain margin and phase margin, Nicholas chart.

Control Components: General block diagram of a control system, a.c. and d.c. Servomotors, a.c. tachometer, synchro transmitter and receiver, synchro pair as control transformer, a.c and d.c position control system, stepper motor. magnetic amplifier

State Space Analysis of continuous System: Concept of state, state variable and state space representation. Block diagrams, transfer function and signal flow graphs in the state space. Review of state variable representation of continuous system, conversion of state variable models to transfer function and vice versa, solution of state equations and state transition matrix, controllability and observability, design of state observer and controller.

Stability: Lyapunov's stability theorems for continuous and discrete systems, methods for generating Lyapunov function for continuous and discrete system, Popov's criterion.

Analysis of Discrete System: Discrete system and discrete time signals, state variable model and transfer model of discrete system, conversion of state variable model to transfer function model and vice versa, modeling of sample hold circuit, solution of state different equations, steady state accuracy, stability on the z-plane and Jury stability criterion, bilinear transformation.

Non-Linear Systems: Types of non linearities, phenomena related to non- linear systems. Analysis of non-linear systems- Linearization method, second order non-linear system on the phase plane, types of phase portraits, singular points, system analysis by phase-plane method, describing function and its application to system analysis.

4. POWER SYSTEM AND SWITCH GEAR PROTOCTION

D.C. & A.C Distribution Systems: Introduction to a Power System (an overall view). Distribution Systems- Feeder, Distribution, service mains. Classification of distribution system. Various types of D.C. and A.C. distributors, Voltage drop calculations.

Overhead AC Transmission Lines Parameters: Types of conductors, bundling of conductors, Resistance calculations, skin effect, proximity effect. Inductance and Capacitance of single phase, 3-phase, single circuit and double circuit lines.

Interference of Power Lines with Communication Lines: Electrostatic and electromagnetic effects.

Performance Of Transmission Lines: Representation and performance of short, medium and long lines. A,B,C,D constants, surge impedance, Ferranti effect.

Insulators for Overhead Lines: Materials for insulators, types of insulators, potential distribution over a string of suspension insulators, methods for equalizing the potential.

Corona: Visual and critical disruptive voltage conditions effecting corona, power loss due to corona, practical considerations.

Underground Cables: Construction of cable, insulating materials, types of cables-Mass impregnated, oil filled and gas filled paper cables, Solid dielectric cables, Gas filled cables, super conducting cables. Electrostatic stresses in a cable, grading of cables, insulation resistance of cables, capacitance of single core and three core cables, heating of cables, current carrying capacity of a cable.

Symmetrical Components and their Applications to Unsymmetrical Fault Analysis: Symmetrical components, sequence impedance's, Sequence networks, unsymmetrical faults: single line to ground , line-to-line , double line ground faults on unloaded alternator and on power system,3-phase short circuits, short circuits capacity of a bus, selection of circuit breakers.

Per Unit Representation of a Power System: Single line diagram, impedance and reactance diagram of a power system, per unit system of calculations, per unit representation of a power system.

Load flow studies: Introduction, Gauss- Siedel method, Newton- Raphson method, Decoupled load flow studies, comparison of load flow methods.

Stability Steady State/Transient stability: Introduction, Dynamics of synchronous machines, power angle equation, node elimination technique, simple systems, steady state stability, transient stability, equal area criterion, numerical solution of swing equations, multi machines stability, factors effecting transient stability.

Switching Surges, traveling waves, surge impedance, open and short-circuited lines, reflected and transmitted waves.

Relay principles and types, general equations for relays, phase and amplitude comparator, static over current, directional and distance relays, carrier current protection, protection of transformers, Alternators, bus bars and lines.

Circuit breaker: principle of arc interruption, recovery and restriking voltage, RRRV, current chopping, Bulk and minimum oil CB, Vacuum interrupters, rating and testing of CBs, HRC fuses.Causes of over voltages, over voltage protection, ground wires, protection against surges, surge absorbers, rating of lighting arresters. Neutral grounding, effectively grounded system, resonant grounding.

5. POWER ELECTRONICS & MEASUREMENTS

Solid state devices: SCR: Basic theory of operation, characteristics: Static and Dynamic, SCR ratings, Protection of SCR against over current, over voltage high dV/dt, de/dt. Snubber circuit, series and Parallel operation of SCR. Gate protection. Firing circuits of SCR. SCR gate characteristics, Two-transistor analogy of SCR. Thyristor family: SCR, TRIAC, DIAC, GITO, PUT, LASCR

Classification of Rectifiers, Phase Controlled rectifiers: Single phase and three phase, half wave and full wave fully controlled and half controlled rectifiers with R, L, E loads with and without free wheeling diodes. Methods of commutation.

AC phase control: Operation of Single phase, Half and full wave AC controller with R, R-L Load, Integral cycle control, sequence control.

Choppers: Principles and basic ckt. Operation, classification, steady state analysis, Control strategies. Communication in chopper circuits.

Inverters: Single phase voltage source Inverters, Voltage control of single phase inverters. Forced-commuted Thyristor, Three phase bridge inverters, Reduction of harmonics

Cycloconverters: Classification, single phase to single phase cycloconverters with resistive inductive load. Three phase to single phase cycloconverters: Half wave and full wave. Three phase to three phase cycloconverters. Output voltage equation of cycloconverters.

Measuring Instruments: Classification, effects utilized in measuring instruments.

Indicating instruments:- Deflection, controlling and damping forces, various dampings.

Ammeters and Voltmeters: Moving coil, moving iron and electrodynamics type ammeter and voltmeters, electrostatic voltmeter, Errors in Ammeters and Voltmeters. Extension of instrument range: Ammeter shunts, Voltmeter multipliers, C.T & P.T.

A.C. Bridges: Measurement of Inductance using:- Maxwell's Inductance-Capacitance bridge, Anderson's bridge Campbell's bridge, Measurement of Capacitance using De-Sauty's bridge, Schering bridge Measurement of Frequency using Wein's bridge.

Oscilloscopes: Introduction- CRO, cathode ray tube, Block diagram of CRO, deflection amplifier and delay line, source and coupling of trigger generator, Automatic time base. Dual trace Oscilloscopes, sweep modes, Measurement of voltage, frequency & phase.

Transducers: Introduction, Principles of operation, Classification of transducers. Summary of factors influencing the choice of transducer, Qualitative treatment of Strain Guage, LVDT, Thermocouple, Piezo- electric crystal and photoelectric transducers.

Mathematics

Differential Calculus, Integral Calculus, Differential Equation: Ordinary and Partial Differential Equations, Matrices, Integral transforms, Complex Analysis, Numerical Methods

E&C Engineering

01. **Communication:-** Random Signal & Noise: Probability, random variables, probability density function. Analog Communication System:- Amplitude & angle modulation & demodulation, spectral analysis of their operations, Fundamentals of Information theory: Entropy information, channel capacity shenuon, theorem, Digital Communication System: PCM, DPCM, ASK, FSK, PS. Basic of TDMA, FDMA, CDMA, & GSM. Optical Fiber Communication: Advantages & disadvantages of OFC, made & configuration, Fiber types, signal degradation, optical sources & detection, optical amplifier.

02. **Signal & Systems/DSP:-** Continuance time, discrete time Fourier services, DFT , FFt, - transform LTI systems causality, stability, convolution, pulse & zeros, impulse response parallel & cascade stricture:

03. **V.L.S.I:-**
    MOSFET types, operations and their characteristics. CMOS inverter operation, fabrication of CMOS inverter using N-well process.
04. **Digital Electronics:-**
    Number System, Combinational & Sequential Logic Circuits.

05. **Electronic Devices:-** Energy bands and Atomic structure, Intrinsic and extrinsic semiconductors, drift & diffusion currents, Mobility, Half effect, generation & recombination of carriers, P-N-diode symbol, Characteristics, Half wave, full wave rectifier, zener diode & its break down phenomenon, tunnel diode, LED, photodiode, varacter diode, Transistors in biased, unbiased condition, Early effect, Ebber moll model, Transistor configurations, Punch through, Reach through phenomenon.

06. **Analog Circuits:-** Diodes clipper, clamper, transistor Biasing compensation Techniques, stability factors of Transistors, Transistors as small signal model, FET, symbol & small signal model, MOSFET theory, Biasing Techniques of FET, Multistage amplifiers, RC-, LC, Transformer compled amplifiers, Miller theorem, cascading of amplifiers and its effect on BW, oscillators, feedback amplifiers, voltage regulators (IC & discrete), power amplifiers.

07. **Op-amps:-** Differential amplifiers, op-amp characteristics, Inverting and Non-inverting amplifiers Inverter, voltage follower, clipper, clamper, summing, scaling, average amplifiers, Integrator, differentiator, timer 555, PLL, filters, oscillators,

08. **E.M. Theory:-**
    Electrostatics: Revision of vector analysis with Cartesian, Spherical & polar coordinates, Coulomb's law, Electric field, Electric flux density, Gauss's law, Divergence theorem, Electrostatics potential, Potential gradient operator, Conductors, Method of images, Energy density in Electrostatics field, Electric field in dielectric media, Capacitance, Solution of Electrostatic problems using Poisson & Laplace equation.

09. **Magnetostatics:** Biot-Savart's & Ampere's circuital law, & their applications, Stroke's theorem, Magnetic flux density, Magnetic potential, Force on a moving charge, Torque on a closed circuit, Energy density in the magnetic field.

10. **Time Varying field & Maxwell Equation:** Faraday's laws, Displacement current Maxwell equation in point & integral form, Application of Maxwell equation to circuits, Resonant cavity, Radiation antennas, Rotating magnetic field theory.

11. **Uniform Plane Wave:** Wave motion in free space & in perfect dielectric, Plane wave in lossy dielectric, pyoting vector, Propagation in good conduction, Skin effect, reflection of uniform plane wave, Standing wave ratio, Polarization.

12. **Signal & Systems:-**
    Definition and Properties of Laplace Transform, Continuous time discrete-time Fourier service, DFT and FFT, discrete time and continuous time Fourier Transform, Z-Transform, Sampling theorem. LTI systems (definitions and properties); Causality impulse response, stability, Convolution, poles and zeros, frequency response, cascade and parallel structure, phase delay group.
13. **Neural Networks Characteristics:-**
    History of development in Neural Networks Principles, Artificial Neural terminology, Model of a neuron, Topology and Types of learning supervised, Unsupervised.
    Learning Rule: The perceptron, Linear separability, Basic Learning lanes, Hebb's rule, Delta rule, Unsupervised learning, Competitive learning, K-means clustering algorithm,
    Different Neural Networks Basic learning lanes in RBF nets, Back propagation algorithm.

Computer Engineering

Object Oriented Programming

Overview of C++, Object Oriented programming, Encapsulation, Polymorphism, Inheritance, Console I/O, C++ Comments. Classes, Metaclass, Abstract class, Public and private variables, Constructor and Destructor Functions, Constructors taking parameters, Object pointers, In-Line Functions, Automatic Inlining, Friend Functions, This Pointer, New & Delete, Array of Objects.
Function Overloading, Overloading Constructor Functions, Operator overloading, Overloading Binary and Unary Operators, Overloading Relational & logical Operators. Inheritance, Using Protected Members, multiple inheritance, Virtual Base Classes, Introduction to Virtual Functions.

Data Structure

Introduction to data structures:- Concepts of data and algorithm, Relation between Data structure & algorithm, Introduction to Time & Space complexity, Data types, Data Structures & Abstract data types, Representation of Arrays, Sparse matrices.
Stacks and Queues:- Concept of stacks, Operation on stacks, Multiple stacks, Application of stacks in Infix, Postfix, Prefix, Recursion, Concept of Queues, Operation on Queues, Multiple Queues, Priority Queues, Circular Queues.
Linked Lists **:- I**nsertion, Deletion and traversal on Linear Linked Lists, Doubly Linked List, circular Linked List, Linked List as data structure, Header nodes, Stacks & Queues using linked list, Dynamic memory management, Garbage Collection
Trees:- Binary trees and it's representation using Linked list, Operations on Binary Trees, Traversal Algorithms, Applications, Threaded Binary Trees and its traversal algorithms, Heterogeneous binary trees, List representation using binary trees, Optimum search trees, AVL trees.
Graphs & Heaps:- Representation of Graphs, traversal methods, Applications undirected graphs, Directed Graph & their traversal, Depth first, Breadth First, Shortest path algorithms, Minimum Cost Spanning tree.
Sorting & Searching:

1. Exchange Sort (Bubble, Quicksort, Heap)
2. Selection & Tree Sorting.
3. Insertion sort, Shell Sort, Address Calculation Sort
4. Merge & Radix Sort.

Sequential Searching, Searching an Ordered Table, Index sequential search, Binary search, Interpolation search, Tree searching.

Computer organization & Architecture

Introduction:- Basic structure of Computers, stored programme concept, Basic Operational concepts, Functional Units, Machine language, concept of memory locations, addresses, addressing modes, instruction format, comparison between mainframe, mini Computer, microcomputer.
Processing and execution:- Processing unit, execution of instructions, control step sequence, different types of instruction, ALU Design, Arithmetic Processes, Control Unit Design, Hardwired & Micro programmed Control Unit.

Input output organisation:- I/O Systems – Programmed Control, Interrupt controlled & DMA Data transfer Schemes, I/O Processors.
Memory Management:- Memory organisation, Characteristics of memory size, Access time, Read/write cycle time, Sequential and Random access semi conductor memories, Virtual memory, Cache memory, Memory Hierarchy, Secondary storage devices- Magnetic Disks, Magnetic Tapes, CD ROM's.
Parallel processing **–** Basic Concepts, Types of parallel Processors, Pipelined processors, Pipelined Structures,
Introduction to SAP Machines.

Relational Database Management Systsem
Basic Concepts:- Data Modeling-Records and files-Abstraction and data integration- Views-Data independence-Components of DBMS-Advantages and disadvantages.
Data Models:- Data associations ,Data models classification , Entity - relationship model, Relational ,Network and Hierarchical models, Comparison of these models.
File Organization :- Introduction, Serial Files, Sequential files, Index Sequential files, Direct Files , Indexing using tree structure, Logical and physical pointers, Record placement.
Relational Model and Relational Data-base Design:- Attributes and domains, Tuples, Relations and schemas, relation representation, keys, Integrity rules, Relational algebra , Relational Calculus. Data Manipulation using SQL. Normalization using functional dependency, Normalization using join dependencies, Normalization using join dependencies, Domain key normal form.
*Crash Recovery***:-** Reliability, Transactions, Recovery in a centralized DBMS, Reflecting updates to the database and recovery, Buffer management, Virtual memory, Disaster recovery.
Distributed Databases:-Introduction, Advantages and disadvantages of DBMS, Networks Data distribution, Object naming, distributed query processing.

Operating System
Introduction Concepts:- Operating System functions & Characteristics, Historical Evolution of O.S., O.S. Services, User O.S. Interface, Computer System Architecture, O.S. Design and Implementation and structure, System calls, System Programs, Virtual Machines, Spooling.
Process Management:- Study of state models, process Scheduling, Job Scheduling, Scheduling Criteria, Scheduling Algorithms, Multiple Process Scheduling.
Process Coordination: Synchronization : Race-Conditions, critical –Section problems, semaphores, Bounded-Buffer Problem, Readers-writers Problem, Dining –Philosophers Problem Deadlocks : Characteristics, Deadlock Prevention, Avoidance, Detection, Recovery.
Memory Management: Logical & Physical Address space, Contiguous & Non-Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Demand paged memory management, Page replacement, Allocation of Frames, Thrashing, Swapping & Overlays, Cache Memory.

Advanced Microprocessor
Introduction to 16-bit Microprocessor: - 8086/8088 architecture, Concept of segmented Memory, Addressing Modes, Instruction Set, Introduction to 80186, 80286, 80386.
8086 Family Assembly Language Programming and Techniques:- Simple Sequence programs. Flags, Jumps, While- Do, Repeat-Until Implementations, Programs using Procedures.

8086 CPU Hardware Design: - 8086 Signals, Minimum and Maximum Mode of CPU model, System Bus Timing, 8086 Interrupt Vector Table, Interrupt Service Subroutine, Applications, Addressing Memory and Ports in Micro Computer System.
Multiprocessor Configuration: - Queue Status, lock facility, 8086/88 based Multiprocessor system, Coprocessor configuration, Introduction to Pentium IV, closely and loosely coupled configuration.

Computer Networks

Introduction : Data Communication-communication system, synchronous and asynchronous systems, serial and parallel systems, dataflow-simplex, half-duplex, full-duplex, computer network-uses of computer network, categories of computer networks, protocol and standards, Reference Model-OSI and TCP/IP reference model, their comparison and critique, Network Topologies

Physical Layer : Data Transmission-Digital to Digital conversion-Line Coding Scheme, Transmission Media, RS-232 Interface, Switching mechanisms and Comparison –circuit, packet, message, Modem and its types

Data Link Layer: Design Issues, Error Detection and Correction, Flow Control-Elementary of data link protocol, Sliding Window Protocol, Example of Data Link Protocol (HDLC).

Medium Access Control Sub layer: Channel Allocation Problems, Multiple Access Protocol-ALOHA, Carrier Sense Multiple Access Protocols, Collision Free Protocols, IEEE standards-802.3, 802.4, 802.5.

Network Layer : Design Issues, Routing Algorithms – the optimality principle, shortest path algorithm, flooding, distance vector routing, link state routing and hierarchical routing, Congestion Control-principles prevention policies, congestion control in virtual circuit subnet and datagram subnets, Traffic shaping algorithm - leaky bucket algorithm, token bucket algorithm, QOS, IP protocol, IP addresses, Internet Multicasting, Introduction to IPV6 ,IPV4 vs IPV6, Internetworking de vices –concept of Internetworking, Repeaters, Hub, Bridges, Switches, Routers, Gateways.

Transport Layer: Transport Layer Services, Primitives, Issues, elements of transport protocol, Introduction to TCP and UDP

Session and Presentation Layer: Design Issues

Application Layer: FTP, DNS, E-Mail ,Introduction to WWW, Firewalls.