

**(APPENDIX-II)**  
**SYLLABUS FOR B.TECH. (LATERAL ENTRY) PART-1**

**MATHEMATICS**

**Unit 1: Ordinary Differential Equation**

Differential equation of first order. Linear differential equation of second order (homogeneous and nonhomogeneous case). Cauchy, Euler's equation, Application of first order differential equations (mixture problem, Newton's law of cooling, orthogonal trajectory). Application to LCR circuits, Application to free and forced vibration of Mass spring system.

**Unit 2: Series Method**

Properties of power series, Radius of convergence of power series, Legendre's equation and Legendre's polynomial, properties of Legendre's polynomial, Gamma function, ordinary and singular point Frobenius method, Bessel's equation and properties of Bessel's function.

**Unit 3: Laplace Transform**

Laplace transforms of standard function, periodic functions, Unit step function, Transforms of derivatives and integrals. Differentiation and integration of transforms, Linearity property, Inverse Laplace transform, Shifting theorems, Convolution. Application to solve differential and integral equations (initial value problem).

**Unit 4: Fourier Series**

Periodic function, Fourier series, Euler's formula, Even and odd functions, Fourier series expansions of even and odd function, half range expansion of functions, Expansion of functions with finite discontinuities.

**Unit 5: Matrix**

Types of matrices, algebra of matrices, rank, solution of non-homogenous system of equations, consistency of the system of equations, Linear dependence and independence, solution of homogeneous system of equation.

Eigen values and eigen vectors. Norm and inner product. Orthogonal and projection matrix.

Application of eigen values and vectors to solve the system of homogeneous linear differential equation.

**Unit 6 : Vectors:**

Vector algebra, product of vectors, vector differentiation, vector differential operator, gradient, directional derivatives, divergence, curl, line integral, double integral, green's theorem.

**ENGINEERING MECHANICS**

**Unit 1:- Statics**

Conditions of equilibrium, concept of free body diagram, methods of moments and solution to engineering problems.

Friction : Static friction, ladder friction, problems with friction, Belt friction and screw jack, force analysis of plane trusses (method of joint, method of sections, plane frames, methods of members), Parallel forces in a plane, Centre of parallel forces, Pappus Guldinus theorems, MI of plane figures, parallel axis theorem, perpendicular axis theorem, Polar MI, Principle of virtual work for a single particle, rigid bodies, ideal systems and constrained bodies.

**Unit 2: Dynamics**

Force proportional to displacement, free vibration, D' Alembert's principle, momentum and impulse. Application to principle of linear momentum to a single particle, rigid bodies and ideal systems. Application to principle of angular momentum to a single particle and rotating rigid bodies. Principle of conservation of momentum.

### **Unit 3: Work and Energy**

Principle of work and energy for ideal system, Conservation of energy.

## **BASIC ELECTRICAL ENGINEERING**

### **Unit 1: Electrostatics**

Coulomb's law, Electric charge, Potential, Field & Capacitance, Potential gradient due to spherical cylindrical and plane charges, Electric force, Flux density and permittivity. Calculation of Capacitance of spherical, coaxial, cylindrical and parallel plate condenser. Energy stored in a electric field.

### **Unit 2: Electromagnetism**

Magnetic field due to current in conductor. Magnetic field intensity and Flux density. Permeability, B-H curves, Magnetisation, Concept in hysteresis. Magnetomotive force and Magnetic reluctance.

Electrodynamic force:- Faraday's law of electromagnetic induction, Eddy current, emf induced in a conductor moving in a magnetic field. Energy stored in a magnetic field.

### **Unit 3: D.C. Circuit**

Current distribution in series and parallel circuit. Power and energy in electric circuit. Star-Delta conversion. Kirchoff's law & its application and solve electric circuit by branch & loop current method & nodal method. Superposition theorem.

### **Unit 4: A.C. Circuit**

Production of alternating current – Instantaneous, average & rms value of current and voltage. Peak factor, Form factor, Amplitude, Frequency, Phase difference, Addition and subtraction of alternating quantity. Phasor diagram, Resistance, Inductance, Capacitance, impedance and admittance- power and power factor-series and parallel circuits. Q factor-Three phase circuit. Star-Delta connection-Active and reactive power. Power measurement with one and two wattmeter methods-Calculation in RLC circuit, in series circuit.

### **Unit 5: Instrument**

Construction and principle of operation-PMMC, MI and dynamometer type ammeter, voltmeter and dynamometer type wattmeter. Power factor meter.

### **Unit 6: Illumination**

Law of illumination- Solid angle, Luminous flux, Luminous intensity, illumination brightness and luminous efficiency.

### **Unit 7: Production Light**

Filament lamp, Arc lamp, Electric discharge lamps, Sodium vapour lamp, Mercury vapour lamp-Theory of electrical energy radiation. Comparison between filament lamp and fluorescent lamp.

## **PART-II**

## **MECHANICAL ENGG.**

### **Unit 1: Strength of Material**

Simple stress and strain, Two dimensional stress system, Stresses in composite section, Thin cylinder and spherical shells under internal pressure, Shear force and Bending moment, Theory of simple bending, Combined axial and bending stress, Torsion, Testing of material.

### **Unit 2: Thermal Engg.**

Thermodynamics concept and properties, Laws of Thermodynamics, Properties and process of ideal gases, Internal combustion engine, Air compressors, Refrigeration, Air conditioning. Properties and process of vapours, Steam Generator, Steam Power cycle., Steam engine, Steam nozzle, Steam turbine, Condenser, Heat transfer, Gas turbine.

### **Unit 3: Machines & Machine Design**

Simple mechanism, Static friction, Friction in screw jack, Clutch, Bearings, Brakes, Power transmission in Belt, Pulleys, Gear drive, Governor & Flywheel, Balancing of machine parts, Vibration in machine parts.

Design of fastening elements, Design of shafts, Keys & Couplings, Design of levers, Design of

belt drives & pulleys, Design of screw jack, Design of closed coil helical spring.

#### **Unit 4: Fluid Mechanics & Hydraulic Machines**

Properties of fluids, Pressure measuring instruments, Bernoulli's equation and its application, Flow through orifices and notches, Flow through pipes, Impact of jet, Turbine, Centrifugal pump, Reciprocating pump.

#### **Unit 5:- Manufacturing Science**

Material classification, Imperfection in crystal, Iron-Carbon system, Different heat treatment methods, Non-ferrous metals and alloys, Bearing material, Spring material, Polymers, Composites and Ceramics. Various forging processes, Different metal forming process such as rolling and extrusion, Foundry practice, Various welding process, Soldering, Brazing, Rivetting, Sheet metal works, Parts and functions of lathe machine, Shaper, Planing machine, Milling machine, Slotter, Grinding machine, Drilling machine, Describe cutting tools, Press tools, Jigs and Fixture, Special casting and powder process, Metrology. Non conventional machining process, Automation, Numerical control, Robot technology, Flexible manufacturing, CAD/CAM, CIM.

### **ELECTRICAL ENGG.**

#### **Unit 1 : Circuit and Network Theory**

i) DC and AC circuit: Power and energy, Ohm's law, Kirchhoff's law, RMS value, Average value, J-operator, RL, RC, RLC series and parallel, Resonance, Transient response to DC circuit.

ii) Electrostatic and magnetic circuits : Magnetising force, mmf, Magnetic flux & intensity, Hysteresis loop, Magnetic circuit, Biot Savart law, Capacitor with composite dielectric, Grouping of capacitor, Coupled circuit.

iii) Network theorem : Mesh and nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Max. power transfer theorem, Reciprocity theorem, Star-Delta transformation.

iv) Polyphase circuit : Relationship between line and phase quantity in star-delta connection, Measurement of 3-phase power, Active, reactive and apparent power.

v) Network functions and parameters: Network functions of one port and two port, network, z-parameter, y-parameter, ABCD parameter, h-parameter, their relationship.

vi) Filters: Ideal passive filter, Condition for pass band, stop band & cut off frequency prototype low pass, high pass, band pass and band stop filter.

#### **Unit 2: Power System and Utilisation of Power**

i) Kelvin's law for economical size of conductor, Corona, Sag calculation, Performance of transmission lines (short and medium), EHV transmission for ac & dc, Distribution systems for ac & dc.

ii) Insulators and types, String efficiency, Ferranti effect and skin effect, Cables (types & testings), power factor improvement and economic aspects, Tariff, Earthing of substation, transmission and distribution lines.

iii) Faults in power system, Fuse and circuit breaker (type & maintenance), Protective systems (primary & back up protection, types of relay), Lighting arrestors and surge diverter, Static relays.

iv) Faraday's law of electrolysis, Commercial use of electrolysis, Electrical heatings, Electrical welding, Laws of illumination and design of lighting schemes, Filament lamp & Discharge lamps.

v) Choice of electric drives, DC & AC traction motors, Control and braking of motors.

#### **Unit 3: Machines**

i) DC Machines : Types, Voltage, Power relation, Different characteristics, Starting & speed control, Calculation of efficiency, braking.

ii) Transformer : emf. equation, Construction, Cooling, Transformer on No load and On load,

Equivalent circuit, Losses, OC and SC test, Efficiency, All day efficiency, Parallel operation, Auto transformer, CT and PT, Tap charging transformer, Connection of three phase transformer and parallel operation.

iii) Alternator : Types of alternator, Constructional detail, Armature winding, emf equation, Armature reaction, Alternator on load, Regulation & OC, SC test of alternator, Characteristics, Parallel operation and load division.

Synchronous motor : Construction & principle of operation, Torque, power development, Power angle characteristics, v- curve & application.

iv) Induction motor : Production of rotating magnetic field, Construction, Principle of operation, Torque- Slip curve, Characteristics, Method of starting, Speed control, Induction generator and application.

v) Rotating field theory of 1- phase induction motor, Ferrari's principle, Different 1- phase induction motor and ac commutator motor.

#### **Unit 4: Power Electronics & Drives**

Construction and principle of operation of power devices (power diode, power transistor, MOSFET, SCR, IGBT, GTO, DIAC, TRIAC, UJT), protection of SCR Controlled rectifiers and inverters, DC and AC regulated power supply, DC motor control (control rectifier device for armature and field control), PLL control, AC motor control (induction motor).

#### **Unit 5:- Measurements**

Deflecting, Controlling & damping arrangements, Calibration of instrument, AC & DC voltmeter & ammeter and extension of range, Dynamometer type Wattmeter, Errors & corrections, Frequency meter, Power factor meter, Induction instruments, Measurement of resistance, Inductance and Capacitance, Types of Transducers (resistive, inductive and capacitive), Piezoelectric device, Photoelectric device, Hall effect, Tachogenerator (ac & dc), Digital transducers, Thermometer, Thermocouple, Optical pyrometer.

## **ELECTRONICS & TELECOMMUNICATION ENGG.**

### **Unit 1: Analog and Digital Electronics**

Semiconductor Physics : Energy band theory of solids, Types of semiconductor, P-N Junction, Zener diode, Rectifier, Ripple factor, Filter circuits.

Transistor and circuit analysis : Types of transistor, Transistor configuration (CB, CE, CC) and characteristics, Relationship between  $\alpha, \beta, \gamma$ , Q-point, Transistor-biasing, Stabilization, Stabilization factor, h-parameter, RC-coupled amplifier, power amplifier, Class-A, Class-B, Class-C, Class-AB, Push-pull amplifier.

Difference between BJT & FET, Characteristics of JFET, Parameters of JFET, MOSFET.

Feedback amplifier and oscillator : Classification of feedback amplifier, Advantages of negative feedback amplifier, Emitter follower, Oscillator, Types of oscillator, Barkhausen criteria.

Wave shaping circuit\_: Clipper, Clamper, Differentiator and integrator using RC, Schmitt trigger.

Op-amp : Characteristics of OPAMP, Application of OPAMP (integrator & differentiator, adder, subtractor, summing), OPAMP parameters like CMRR, Slewrate, SVRR, etc.

Number system\_: Binary, Octal, Decimal & Hexa decimal number system, Conversion of number system, 1's complement, 2's complement, Binary arithmetic.

Binary codes\_: Weighted code and non-weighted code, BCD code, Gray code, Excess-3 code, ASCII code, EBCDIC code.

Logic gates :- AND, OR, NOR, NOT, X-OR, NAND, X-NOR.

Boolean algebra and combinational circuit: Concept of Boolean algebra, Theorem, Postulates, Minterm, Maxterm, POS, SOP, K-map, Don't care condition.

Sequential circuit : Flip- Flop, Counter, Shift Register, A/D-D/A converter.

### **Unit 2: Communication and Microwave**

Analog communication: Amplitude, Frequency and phase modulation, Frequency spectrum, SSB Vs DSB, Power relation of Am wave, Vestigial sideband signal, Concept of multiplexing, Demodulation, Concept of PLL.

Digital Communication : Noise, Channel capacity formula, Digital modulation technique, ASK, FSK, PSK, QASK, QPSK, PCM, DPCM, Delta modulation.

Wave propagation and radio communication : Concept of electromagnetic waves, Wave radiation, Mechanism of radiation, Pattern of antenna, Parameters of antenna like Antenna gain, Directivity, Bandwidth, Beamwidth, Efficiency. Types of antenna like lens, Horn, Helix, Parabolic reflector, Yagi- uda antenna. TRF receiver, Superheterodyne receiver, Receiver characteristics.

Satellite and optical fiber communication : Geostationary satellite, Frequency allocation, GEO, LEO, MEO, INSAT, Optical fibers, Advantages and disadvantages, LASER, LED, PIN photodiode.

Microwave communication : Waveguide and Resonator, Klystron, Microwave tubes, Microwave devices, MASER Vs LASER, Tunnel diode, Gun diode, Snap diode.

### **Unit 3: Circuit Theory**

Network elements : Ideal and controlled voltage and current sources, conversion of ideal sources, R.M.S value, Average value, Phase, Phase difference, vector representation of a.c. quantity, j-operator, RL – RC-RLC series and parallel combination, Power and Power factor, Resonance ( series and parallel), Selectivity and Q factor, Transient response to DC circuits.

Network theorems : Mesh analysis, Nodal analysis, Superposition, Thevenin's, Norton, Maximum power transfer theorem, Reciprocating theorem, Star – Delta transform.

Polyphase circuit : Line and phase quantity in Star – Delta connection, Measurement of 3-phase power.

Network function and parameters : Z, Y, ABCD, h-parameter, Relationship of parameters, T and  $\pi$  network and conversion, Input and Output impedance, Image parameters, Relationship between db and neper, Prototype and m-derived filters, Attenuators ( symmetrical T &  $\pi$  type ).

### **Unit 4: Electronics Measurements**

Electronics Measurement : Measure voltage, current (DC & AC) by CRO, Measure unknown frequency by Lossajous figure, Measurement of phase angle of signal by CRO.

Electronic Measuring instruments : Advantage and disadvantages of electronic instruments over conventional meter, Voltmeter, Electronic multimeter, Ohm meter, Differential voltmeter.

Measurement of lumped circuit : Measure DC resistance, Equation of Bridge-balance, AC bridge, AC wheatstone bridge, Maxwell's bridge, Hay's bridge, Q-meter.

Waveform measurement : Wave analyzer, Heterodyne wave analyzer, Signal generator, Harmonic distortion analyzer..

Digital measurement : digital meter, digital voltmeter, digital frequency meter.

### **Unit 5: Microprocessor**

Introduction : Microprocessor Vs Microcomputer, Generation of Microprocessor.

8085 – Microprocessor : Architecture, BUS, Pin structure of 8085, Program counter, Stack pointer, Register, Flag register.

Instruction set of 8085 : Instruction, Addressing data, addressing mode, Branch, Subroutine, I/O machine control group, Assembly language programme, Timing diagram.

Interfacing I/O programming : PIN diagram of 8255, 8259, Programming with I/O chips like 8255, 8259, ADC and DAC.

8086 – Microprocessor : Architecture, Pin diagram, Concept of coprocessor .

## CIVIL ENGG..

### **Unit 1: Structural Engg**

#### a. Design of Structure :

R.C.C. :- Limit State Method of Design – For collapse of singly reinforced members in bending, For shear, For bend, Anchorage and development lengths Limit State method of design for beams, slabs and axially loaded columns, footing.

b. Steel Structure:- Design of steel structure for tension and compression members and simple beams.

### **Unit 2: Water Resource Engg .**

Rainfall , Run off, Water requirements of crops, Flow irrigation, Diversion headwork's, Regulatory works, Cross drainage works.

### **Unit 3: Transportation Engg.**

a. Highway Engg : Introduction, Road Geometric, Road materials, Road pavements.

b. Railway Engg : Introduction, Permanent way, Track materials, Geometric of broad gauge, Points and crossing.

Bridges : Introduction, Foundations, Substructure and approaches, Permanent bridges.

Docks & Harbours : Introduction, Harbour, Break waters, jetties & quays, Docks.

### **Unit 4: Concrete Technology**

a. Civil Engg Materials : Bricks, Cement, Mortar & concrete, Timber.

b. Construction Technology : Foundations, Walls Brick masonry, Stone masonry, Shoring & underpinning, Damp proofing.

c. Estimating & Construction Management : Detail estimate, Calculation of dry materials and Analysis of rates.

Construction management : Planning, Scheduling, PERT & CPM.

### **Unit 5: Surveying & Environmental Engg.**

a. Surveying : Levelling, Contouring, Theodolite surveying, Curves, Modern surveying, Instruments like EDM & total station.

b. Environmental Engg.

Water supply :- Introduction, Quantity of water, Quality of water, Treatment of water, Distribution system, Appurtenances.

Sanitary :- Introduction, Quantity of sewage, Sewage characteristics, Sewage disposal, Sewage treatment.

## COMPUTER SCIENCE & ENGG.

### **Unit 1: Programming Languages C, C++ :**

Data types, Variables, Operators, Expressions, Input – output operators, Control structure, Functions, Storage classes, Array, Pointer, Structure, Union, File handling.

Concepts of OOP, Data types, Operators, Functions, Classes, Objects, Constructor, Destructor, Operator overloading, Function overloading, Inheritance, Polymorphism.

### **Unit 2: Data Structure and Operating Systems**

Time and space complexity, Array, String, Stack, Queue, Linked list, Tree, Graph, Different sorting and searching techniques.

Concepts regarding Batch systems, Multiprogrammed system, Time sharing systems, Distributed system, Real time system, Process, CPU scheduling, Synchronization Dead lock, Memory management, Virtual memory.

### **Unit 3: Digital Electronics & Microprocessor :**

Number system, Different coding methods, Boolean algebra, Logic gates, Minimization techniques, Combinational logic design, Flip flops, Sequential logic design i.e. counters & shift registers.

Pin diagram and Block diagram of 8085 microprocessors, Timing diagram, Instruction set Addressing modes, Assembly language programming, Interfacing peripheral devices, Data transfer schemes, 8255 PPL, 8257 DMA, Dealy subroutine, Introduction to 8086 microprocessor.

#### **Unit 4: Computer Organisation & Architecture :**

Basic organization of computer, Classification of computer, Introduction to compiler, Interpreter, Loader, Linker, Design of functional units like ALU & CU.

Memory organization :- Types of memory, RAM, ROM, Cache memory, Mapping functions, secondary memory, Virtual memory.

Input-output organization :- Methods of interfacing, Address-space partitioning, Data transfer techniques, Interrupts.

#### **Unit 5: Computer Network & Dbms :**

OSI reference model, TCP/IP model, Network topologies, Transmission media, Switching, Multiplexing, Error detection & correction, IEEE LAN standards, Routing methods.

Introduction to database, Advantages of database system, Data independence, Architecture of database, Different models-Relational, Hierarchical, Network, E-R models, Relational algebra, Calculus, Normal forms, SQL query .

### **INFORMATION TECHNOLOGY**

#### **Unit 1:- Programming Languages C, C++**

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Concepts of OOP, Data types, Operators, Functions, Classes, Objects, Constructor, Destructor, Operator overloading, Function overloading, Inheritance, Polymorphism.

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#### **Unit 4: Computer Network & Web Technology :**

OSI reference model, TCP/IP model, Network topologies, Transmission media, Switching, Multiplexing, Error detection & correction, IEEE LAN standards, Routing methods.

Internet security, Models of E-commerce, electronic payment system, Digital signature, Use of debit cards & credit cards in E-commerce, M-commerce, HTML, Search engines.

#### **Unit 5: Software Engg. & Multimedia :**

Different software life cycle models, software project management, Requirement analysis & specification, Software design, Coding, Testing, Implementation, Maintenance.

Multimedia concepts, Application of multimedia, Multimedia software products, Sound & audio, Image and graphics, Motion video, Data compression.

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Semiconductor Physics : Energy band theory of solids, types of semiconductor, P-N junction, Zener diode, Rectifier, Ripple factor, Filter circuits.

Transistor and circuit analysis : Types of transistor, Transistor configuration (CB, CE, CC) and characteristics, Relationship between  $\alpha, \beta, \gamma$ , Q-point, Transistor biasing, Stabilization, Stabilization factor, h-parameter, RC-coupled amplifier, Power amplifier, Class-A, Class-B, Class-C, Class-AB, push-pull amplifier.

Difference between BJT & FET, Characteristics of JFET, Parameters of JFET, MOSFET.

Feedback amplifier and oscillator :  
Classification of feedback amplifier, Advantages of negative feedback amplifier, Emitter follower, Oscillator, Types of oscillator, Barkhausen criteria.

Wave shaping circuit : Clipper, Clamper, Differentiator and integrator using RC, Schmitt trigger.

Op-amp : Characteristics of OPAMP, Application of OPAMP (integrator & differentiator, adder, subtractor, summing), OPAMP parameters like CMRR, Slewrate, SVRR etc.

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Binary codes : Weighted code and non-weighted code, BCD code, Gray code, Excess-3 code, ASCII code, EBCDIC code.

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Concept of Boolean algebra, Theorem, Postulates, Minterm, Maxterm, POS, SOP, K-map, Don't care condition.

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Magnetising force, mmf, Magnetic flux & intensity, Hysteresis loop, Magnetic circuit, Biot Savart law, Capacitor with composite dielectric, Grouping of capacitor, Coupled circuit.

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iv) Polyphase Circuit : Relationship between line and phase quantity in star-delta

connection, Measurement of 3-phase power, Active, reactive and apparent power.

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Network functions of one port and two port network, z-parameter, y-parameter, ABCD parameter, h-parameter, their relationship.

vi) Filters : Ideal passive filter, Condition for pass band, stop band & cut off frequency prototype low pass, high pass and band stop filter.

## Unit 3: Electrical & Electronics Measurement

Electrical Measurement : Deflecting, Controlling & damping arrangements, Calibration of instrument, AC & DC voltmeter & ammeter and extension of range, Dynamometer type Wattmeter, Errors & correction, Frequency meter, Power factor meter, Induction instruments, Measurement of resistance, Inductance and Capacitance, Types of Transducers( resistive, inductive and capacitive), piezoelectric device, Photoelectric device, Hall effect, Tachogenerator ( ac & dc), Digital transducers, Thermometer, Thermocouple, Optical pyrometer.

Electronics Measurement : Measure voltage, current (DC & AC) by CRO, Measure unknown frequency by Lossajous figure, Measurement of phase angle of signal by CRO.

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control group, Assembly language programme, Timing diagram.

Interfacing I/O programming : PIN diagram of 8255,

i) DC Machines : Types, Voltage, Power relation, Different characteristics, Starting & speed control, Calculation of efficiency

8259, Programming with I/O chips like 8255, 8259, ADC and DAC.

8086 Microprocessor : Architecture, Pin diagram, Concept of coprocessor like 80186, 80286, 80386.

### **Unit 5: Electrical Machines**

ii) Transformer : emf equation, Construction, Cooling arrangement, Basic working of transformer, Transformer on No load and On load, Equivalent circuit, Losses, OC and SC test, Efficiency, All day efficiency. Voltage regulation.

iii) Alternator : Types of alternator, Constructional detail, emf equation, Armature reaction, Regulation & OC, SC test of alternator Parallel operation and load sharing.

iv) Synchronous motor : Construction & principle of operation, Torque, Power development, Power angle characteristics, v-curve & application.

v) Induction motor (3phase): ( Production of rotating magnetic field, Construction, Principle of operation, Torque-slip curve, Characteristics, Method of starting, Speed control.

vi) Induction motor ( 1 phase): Revolving field theory, Ferrari's principle, Different starting method of 1-phase induction motor.