

Engineering and Management Institute of India

Diploma in Engineering

ELECTRICAL & ELECTRONIC ENGINEERING SYLLABUS

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Department of Electrical & Electronic Engineering

Vision:-

To strengthen the region through imparting superior quality technical education and research; which enables the fulfillment of industrial challenge and establish itself as a Centre of Excellence in the field of Electrical & Electronic Engineering.

Power Electronics (EEE-2.1)**UNIT-I****Introduction to thyristors and other power electronics devices:-**

Construction, working principles of SCR, two transistor analogy of SCR, VI characteristics of SCR. SCR specifications and ratings. Different methods of SCR triggering. Create Triggering using R, RC and UJT triggering. Different commutation circuit for SCR. Series and parallel operation of SCR. Construction and working principle of DIAC, TRIAC & their V-I characteristics. Construction, working principle of UJT, VI characteristics of UJT. UJT as relaxation oscillator. Brief introduction to Gate Turn off thyristors (GTO), Programmable uni-junction transistor (PUT), Basic idea about the selection of Heat sink for thyristors. Application of SCR such as light intensity control, speed control of universal motors, fan regulator, battery charger.

UNIT –II

Controlled Rectifiers :- Single phase half wave controlled rectifier with load (R, R-L), Single phase half controlled full wave rectifier (R, R-L) Fully controlled full wave bridge rectifier. Single phase full wave centre tap rectifier.

Uninterrupted Power supplies :- UPS, on-line, off line & its specifications.

UNIT – III

Inverters, Choppers, Dual Converters and Cyclo converters:- Principle of operation of basic series and parallel inverter circuits, concepts of duty cycle of series and parallel. Inverters & their application. Choppers: Introduction, types of choppers (Class A, Class B, Class C and Class D). Step up and step down choppers. Dual Converters and Cyclo converters: Introduction, types and basic working principle of dual converters and Cyclo converters and their application.

UNIT – IV

Thyristorised Control of Electric Drives:- DC drive control: Half wave drives. Full wave drives, Chopper drives (Speed control of DC motor using choppers), AC drive control: Phase control (Speed control of induction motor using variable frequency), Constant V/F, operation, Cyclo converter/Inverter drives. Slip power control of AC drives.

UNIT –V

Switch Realization and Switching Loss Calculation:- Review of Quadrant operation of Ideal Switches: Diode, Thyristor, BJT, IGBT, MOSFET and TRIAC-Realization of Semiconductor switch for one quadrant operation, Current bidirectional operation, Voltage bidirectional operation, four quadrant operation- Thermal Design of Power Switching Devices-Estimation of loss in switch: Conduction Loss Switching Loss – Blocking Loss- Transistor Switching with Clamped Inductive Load.

Reference Book :-

1. Power Electronics by P.C. Sen.
2. Power Electronics by P.S. Bhimbhrah.

Electrical Machine-I (EEE-2.2)**UNIT-I**

Three phase Supply and Transformers:- Three Phase Supply, Advantage of three-phase system over single-phase system. Star Delta connections Relation between phase and line voltage and current in a three phase system, Power and power factor in three-phase system and their measurements by one, two and three Wattmeter methods. Principle of operation and constructional details of single phase and three-phase transformer, core type and shell type transformers, difference between single phase and three phase transformers, advantages and disadvantages. Voltage Regulation of a transformer (No Derivation), Losses in a transformer, Efficiency, condition for maximum efficiency and all day efficiency, Auto transformers and instrument transformer, CTs and PTs (Current transformer and potential transformer).

UNIT –II

Introduction to Rotating Electrical Machines:- M.F induced in a coil rotating in a magnetic field. Definition of motor and generator, Basic principle of a generator and a motor , Torque due to alignment of two magnetic fields and the concept of Torque angle, Basic Electromagnetic laws, Common features of rotating electrical machines.

UNIT – III

DC Machines:- Principle of working of d.c motors and d.c generator, their constructional details, Function of the commutator for motoring and generating action, Factors determining the speed of a DC, motor Different types of excitation, Characteristics of different types of DC machines, Starting of DC motors and starters. Application of DC machines.

UNIT – IV

A.C. Motors:- Revolving magnetic field produced by poly phase supply, Brief introduction about three phase induction motors, its principle of operation, Types of induction motors and constructional features of squirrel cage and slip-ring motors, Starting and speed control, Star Delta and DOL (Direct-on-line) starters. Reversal of direction of rotation of 3-phase induction motors, Applications of induction motors, Principle and Working of Synchronous Machines (only), Application of Synchronous Machines.

UNIT –V

Single Phase Fractional Kilowatt Motors:- Introduction , Principle of operation of single phase motors, Types of single phase induction motors and their constructional details (i.e. split phase, capacitor start, capacitor start and run, shaded pole and reluctance start) Single phase synchronous motors – reluctance motor (hysteresis motor), Commutator type singlephase motors – Repulsion Induction motor, shaded pole motors, AC series motor and universal motors, Introduction to servo- motors and stepper motors, Concept of micro-motors.

Reference Book :-

- 1 Electrical Machines by SK Sahdev.
2. Electrical Machine by SK Bhattacharya.

Transmission & distribution (EEE-2.3)**UNIT-I**

Transmission Line Parameters:- Structure of power system-Parameter of single and three phase transmission lines with single and double circuits – Resistance, inductance and capacitance of solid, stranded and bundled conductors, symmetrical and unsymmetrical spacing and transposition- application of self and mutual GMD; skin and proximity effects-Typical configurations, conductor types and electrical parameters of EHV lines.

UNIT –II

Modelling and Performance of transmission lines:- Performance of transmission lines- short line, medium line and long line- equivalent circuit, phasor diagram, attenuation constant, phase constant surge impedance- transmission efficiency and voltage regulation, real and reactive power flow in lines- Power circle diagrams- Formation of Corona- Critical Voltages- Effect on Line Performance.

UNIT – III

Mechanical Design of Line:- Mechanical design of OH lines- Line Supports- Types of towers- Stress and Sag Calculation- Effects of Wind and Ice Loading. Insulators. Types, voltage distribution in insulators string, improvement of string efficiency, testing of insulators.

UNIT – IV

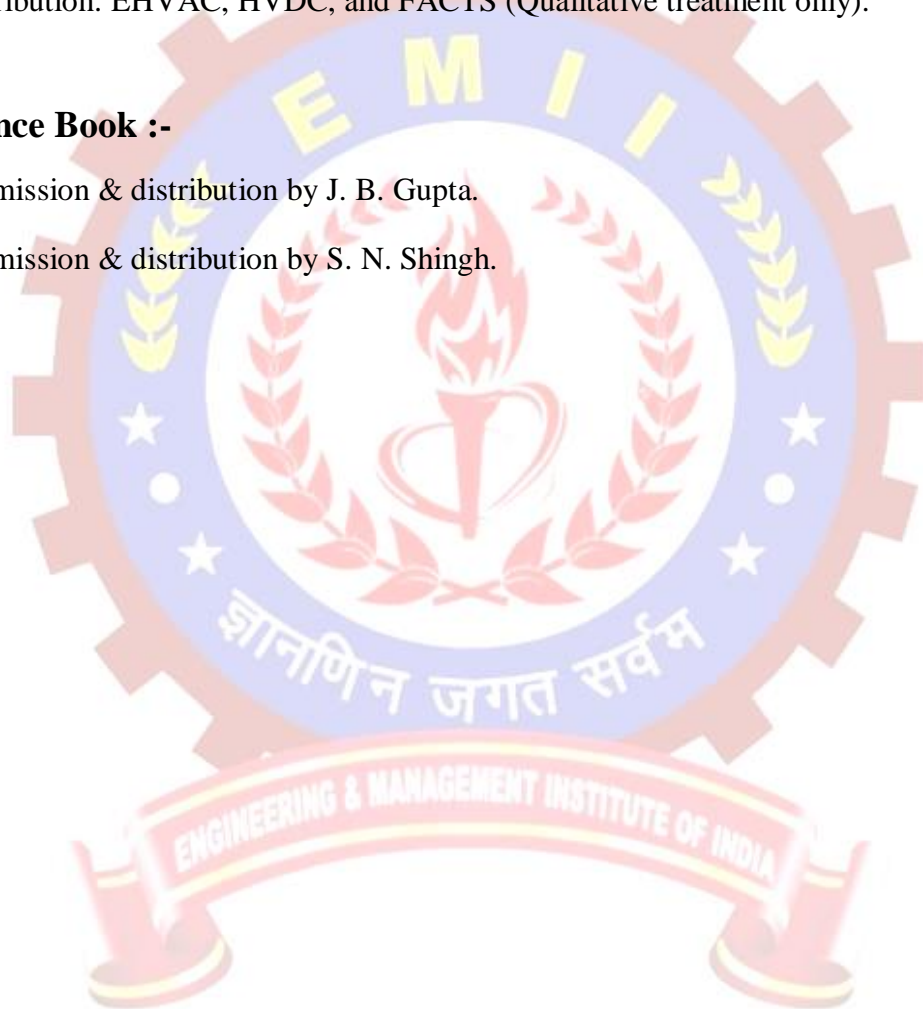
Under Groung Cabilitys:- Underground cabilitys- Types of cabilitys- Construction of single core and 3 core Cabilitys- Insulation Resistance- Potential Gradient-Capacitance of single- core and 3 core cabilitys- Grading of cabilitys- Power factor and heating of cabilitys- DC cabilitys.

UNIT –V

Distribution System:- Distribution System- General Aspects- Kelvin's Law – AC and DC distribution- Techniques of voltage control and power factor improvement— Distribution loss- Types of substations- Methods of Grounding- Trends in Transmission and Distribution: EHVAC, HVDC, and FACTS (Qualitative treatment only).

Reference Book :-

1. Transmission & distribution by J. B. Gupta.
2. Transmission & distribution by S. N. Shingh.



Electrical Power Generation (EEE-2.4)

UNIT-I

Thermal Power Station:- Energy conversion process for thermal power station with plant layout Selection criteria for site of thermal power station Line diagram of thermal power station; Different cycles of thermal power station Major equipment and auxiliaries of thermal power station Load curve and load duration curve Terms and factors related to power plant Base load and peak load stations Coal based thermal power stations in Gujarat.

UNIT –II

Hydro Power Station:- Energy conversion process for hydro-power station (HPS) with plant layout Selection of site for HPS Classification of HPS: based on head, Storage and pondage type, Plant Layout, types of water turbines Auxiliaries of HPS Major features of HPS Hydro power stations in Gujarat.

UNIT – III

Solar Power Plant:- Solar constants, Measurement of solar radiations Solar Energy Conversion CSP generators, construction and working principle construction of a solar PV Systems: Solar cell, Module, Panel and array Types of solar PV system i. Stand – Alone Solar PV system ii. Grid-Interactive solar PV system iii. Hybrid Solar PV system Grid connection issues of solar power plants.

UNIT – IV

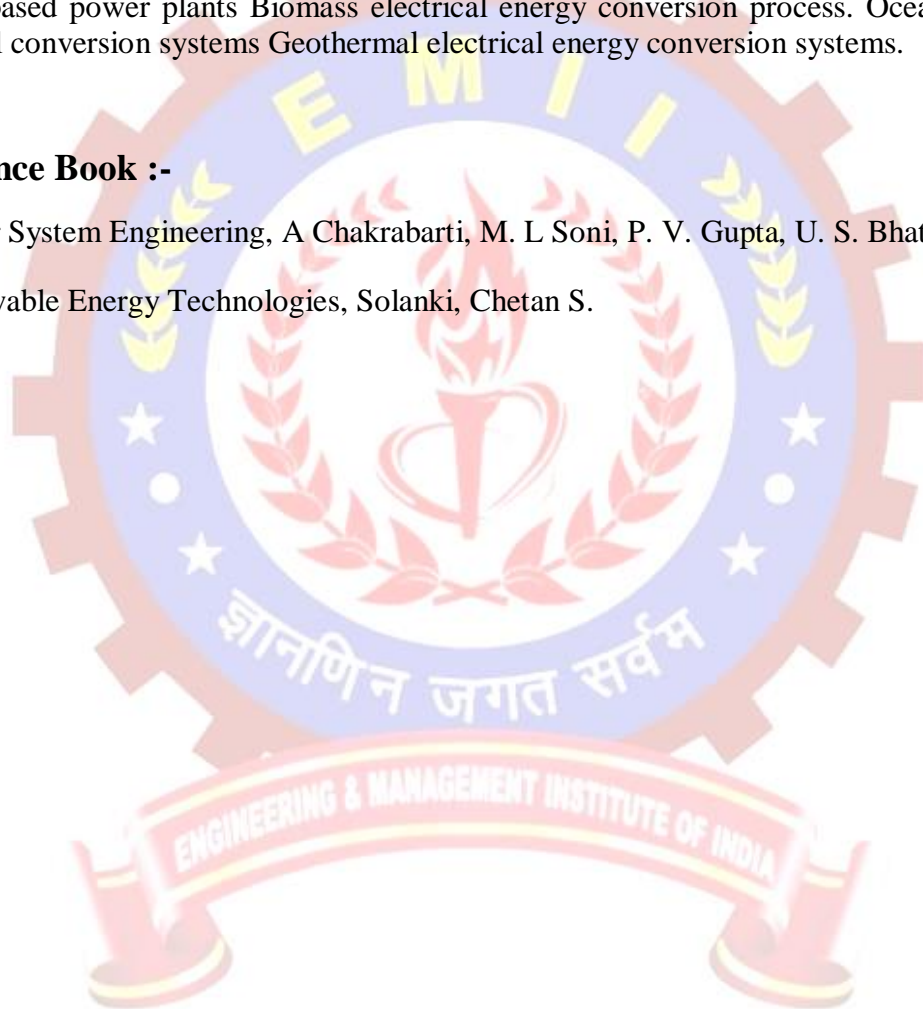
Wind Power Plant:- Anemometer and wind vane Site selection, wind speed, wind direction and its relationship with wind power Wind turbine types and their construction Drag and lift principle of rotation of the wind turbine rotor. Geared WPPs, direct drive WPPs and Hybrid WPPs Stall control, pitch control and active stall control of WPPs. Squirrel cage Induction Generators(IG), wound rotor IG, doubly fed IG, Wound rotor synchronous generator Permanent magnet synchronous generator Direct-drive.

UNIT -V

Captive power plant and other renewable energy sources:- Single line diagram, energy conversion process, advantages, disadvantages and limitations of DG sets
Single line diagram, energy conversion process, advantages, disadvantages and limitations of Gas based power plants
Biomass electrical energy conversion process. Ocean energy electrical conversion systems
Geothermal electrical energy conversion systems.

Reference Book :-

1. Power System Engineering, A Chakrabarti, M. L. Soni, P. V. Gupta, U. S. Bhatnagar.
2. Renewable Energy Technologies, Solanki, Chetan S.



Electrical Circuit Theory (EEE-2.5)**UNIT-I**

Network Parameters:- Active and passive, Linear and non-linear, Unilateral and bilateral, Lumped and distributed, Time varying and time invariant parameters, Voltage and current sources (ideal and practical), Dependent and Independent sources, Source conversion techniques.

UNIT –II

Network Theorems:- Node and mesh analysis, Solution by Kramer's rule up to three variables, Star-delta transformation, Superposition theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Millman's theorem, Tellegen's theorem.

UNIT – III

Circuit Transients:- Introduction to Laplace transform and inverse Laplace transformations, Laplace transformation of following functions- Unit impulse function, Unit step function, Exponential function, Ramp function, Sinusoidal function, Derivative function, Integral function, Laplace transformation theorem- Shifting Theorem, Shift in 's' domain theorem, Complex differentiation theorem, Final value theorem, Initial value theorem, Complex integration theorem, Solution of series RL, RC and RLC circuits by Laplace transformation.

UNIT – IV

Complex Frequency and Pole-Zero Diagram: Concept of complex frequency, Poles and zeros of simple function, Plotting of poles and zero diagram of a simple function (up to second order), Necessary conditions of pole and zero locations of driving point functions.

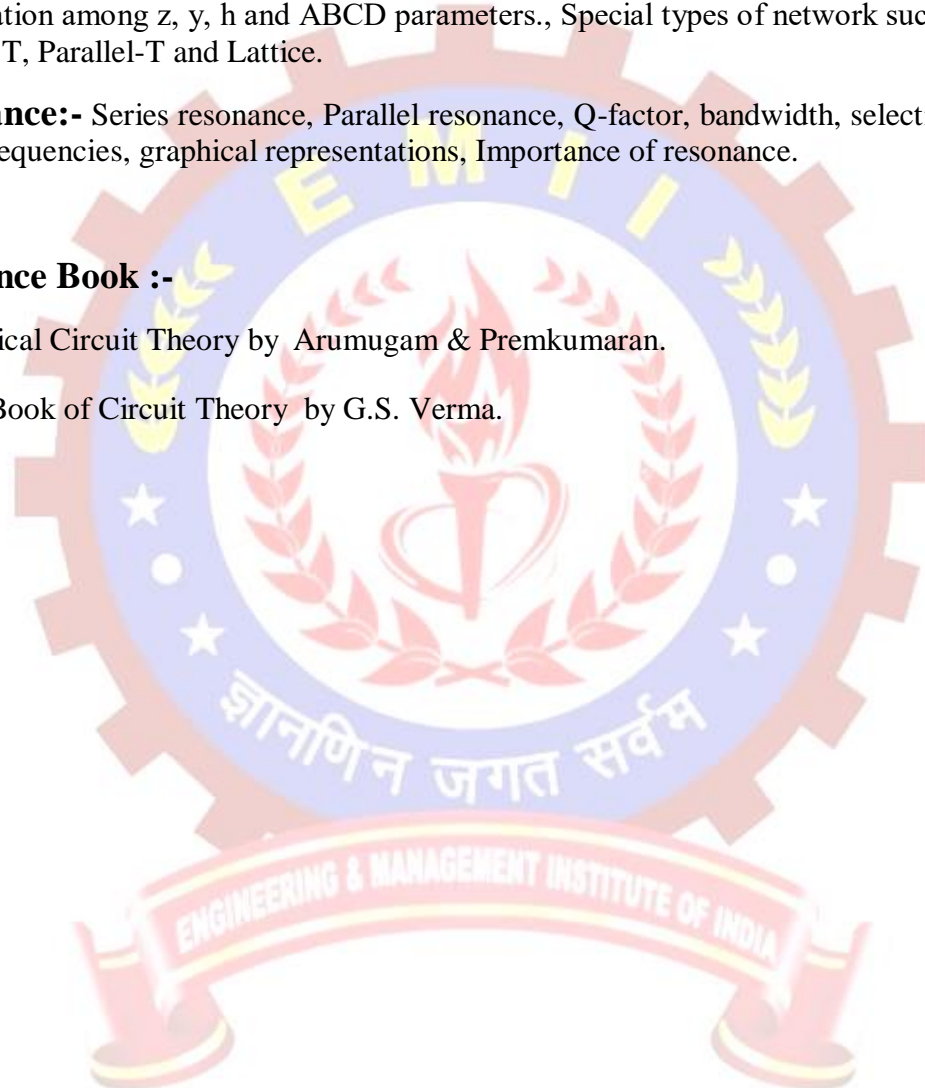
UNIT -V

Two Port Network:- z-parameters, y-parameters, h-parameters, ABCD- parameters, Inter relation among z, y, h and ABCD parameters., Special types of network such as T, π , Bridge - T, Parallel-T and Lattice.

Resonance:- Series resonance, Parallel resonance, Q-factor, bandwidth, selectivity, half power frequencies, graphical representations, Importance of resonance.

Reference Book :-

1. Electrical Circuit Theory by Arumugam & Premkumaran.
2. Text Book of Circuit Theory by G.S. Verma.



Electrical Electronics Measurement (EEE-2.6)**UNIT-I**

Ammeters and Voltmeters:- Classification of instruments, Operating forces, Deflecting , controlling, Damping Torque. Principle Constructional features and working of moving coil and moving iron instruments. Rectifier type voltmeter, Electrostatic voltmeter. Extension of range of voltmeter and ammeters. Calibration of voltmeter and ammeter.

UNIT –II

Measurement Of Power and Energy:- Methods of measuring single phase and 3-phase power constructional features and working of dynamometer type wattmeter. Single phase and three phase energy meter. Energy meter Errors and their adjustments. Calibration of single phase energy meter and wattmeter.

UNIT – III

Measurement Of Resistance:- Measurement of low , medium and high resistances. Construction, working and applications of ohm meter, and megger, Compton potential.

UNIT – IV

DC & AC Bridges:- Whetstones Bridge, carey faster bridge. Kelvin double bridge, Maxwell's bridge. Maxwell wein's Bridge. Concept and uses of CT & PT.

UNIT -V

Construction and working:- of power factor meter, frequency meter, synchro scope and maximum demand indicator. The cathode ray Oscilloscope Block diagram description and operating controls of a cathode ray oscilloscope (CRO) Measurement of voltage, phase angle and frequency by means of a CRO.

Reference Book :-

1. Electrical Measurement & Measuring Instrument by R.K. Rajput.
2. Electrical Measurement & Measuring Instrument by Aanand.



SWITCH GEAR AND PROTECTION (EEE-2.7)**UNIT-I**

Protective Devices :- Philosophy of protection, Nature, Causes and consequences of faults, Zone of protection, Requirements of a protective scheme, Basic terminology components of protection scheme. Relay classification, Principle of different types of electromagnetic relay. General equation of phase and magnitude comparators, Duality of comparators, Electromagnetic relays, over current relays Directional relays, Distance relay- impedance, Reactance and Mho type, Differential relays.

UNIT –II

Feeder Protection :- Over current and earth fault protection, Distance protection, Pilot wire protection, Carrier current protection.

Generator Protection:- Biased differential protection, restricted earth fault protection, Field suppression, Negative sequence protection, Earth fault detection in rotor circuit.

UNIT – III

Power transformer Protection :- Biased differential protections, restricted earth fault protection, Buchholz relay Protection of combined transformer and alternator.

Bus Zone Protection :- frame leakage and circulating current scheme-use of Translay relay.

UNIT – IV

Circuit Breakers :- Formation of arc during circuit breaking. Characteristics of electric arc. Theories of arc Interruption. Recovery and restriking voltage, interruption of capacitive and inductive currents. Current chopping. Principle of A.C. and D.C. circuit breaking requirements of good circuit breaker circuit breaker rating.

Different types of circuit breakers:- Air break and Air blast circuit breaker. Plain break and controlled break all circuit breakers. Minimum oil circuit breakers. Vacuum circuit breaker, SF6 circuit breaker. D.C. Circuit breaker. H.R.C. Fuse, Construction and characteristics.

UNIT -V

Static Relays :- Development and classification of static relays, Different types of phase and amplitude capacitors, Basic static relays used in protective scheme, Elementary idea about digital & numerical protection. Testing and maintenance of protective gear, Protection against surge-surge absorber, Surge diverter.

Reference Book :-

1. Switch Gear & Protection by Van C Warrington.
2. Switch Gear & Protection by T S Madhav Rao.

Elements of Electrical Engineering (EEE-2.8)**UNIT-I**

GENERAL:- Concepts of E.M.F., potential difference and current, resistance, effect of temperature on resistance, resistance temperature coefficient, and insulation resistance. S.I. units of work, power and energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems, batteries and cells, their types, primary cells and secondary cells, Lead Acid, Ni-Cd and NiMH batteries, current capacity and cell ratings, charging methods and maintenance procedure.

D.C. CIRCUITS:- Classification of electrical networks, Ohm's law, Kirchhoff's law and their applications for network solutions. Simplifications of networks using series and parallel combinations and star-delta conversions.

UNIT –II

Electrical Wiring:- Connectors and switches, systems of wiring, domestic wiring installation, sub circuits in domestic wiring, simple control circuit in domestic installation, industrial electrification.

Illumination:- Types of lamps, fixtures and reflectors, illumination schemes for domestic, industrial and commercial premises, Lumen requirements for different categories.

Safety and Protection:- Safety, electric shock, first aid for electric shock and other hazards, safety rules, use of multi-meters, grounding, importance of grounding, equipment grounding for safety, circuit protection devices, fuses, MCB, ELCB and relays.

UNIT – III

Electrostatics:- Electrostatics field, electric flux density, electric field strength, absolute permittivity, relative permittivity, capacitance and capacitor, composite dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors and time constant.

AC Fundamentals:- Sinusoidal voltages and currents, their mathematical and graphical representation, concept of instantaneous, peak (maximum), average and R.M.S. values, frequency, cycle, period, peak factor and form factor, phase difference, lagging, leading and in phase quantities and phasor representation. Rectangular and polar representation of phasors.

UNIT – IV

ELECTROMAGNETISM:- Magnetic effect of an electric current, cross and dot conventions, right hand thumb rule and cork screw rule, nature of magnetic field of long straight conductor and toroid. Concept of M.M.F., flux, flux density, reluctance, permeability and field strength, their units and relationships. Simple series and parallel magnetic circuits, analogy of electrical and magnetic circuit, force on current carrying conductors placed in magnetic field, Fleming's left hand rule. Faradays laws of electromagnetic induction, statically and dynamically induced E.M.F., self and mutual inductance, coefficient of couplings. Energy stored in magnetic field. Charging and discharging of inductor and time constant.

UNIT –V

SINGLE PHASE A.C. CIRCUITS:- Study of A.C. circuits consisting of pure resistance, pure inductance, pure capacitance and corresponding voltage-current phasor diagrams and waveforms. Development of concept of reactance, study of series R-L, R-C, R-L-C circuit and resonance, study of parallel R-L, R-C and R-L-C circuit, concept of impedance, admittance, conductance and susceptance in case of above combinations and relevant voltage-current phasor diagrams, concept of active, reactive and apparent power and power factor.

Reference Book :-

1. Elements of Electrical Engg. by H. Cotton.
2. Elements of Electrical Engg. by V. K. Mehta.

Utilization Of Electrical Energy (EEE-2.9)

UNIT-I

Illumination:- Laws of illumination. Illumination at a point due to one & several point sources. Design of lighting schemes. Associated terms, number and location of sources. Street lighting & area lighting. Construction, working & circuitry of different types of lamps and their relative merits.

UNIT –II

Electric Heating:- Advantages of electric heating. Direct & indirect resistance heating. Properties and design of heating elements. Electric ovens. Induction heating, core type & coreless induction furnaces. electric arc heating. Dielectric heating.

UNIT – III

Electric Welding and Electric- Chemical Processes:- Electric arc welding. Arc welding equipments and circuitry. Laws of electrolysis. Equipments & process used for electroplating.

UNIT – IV

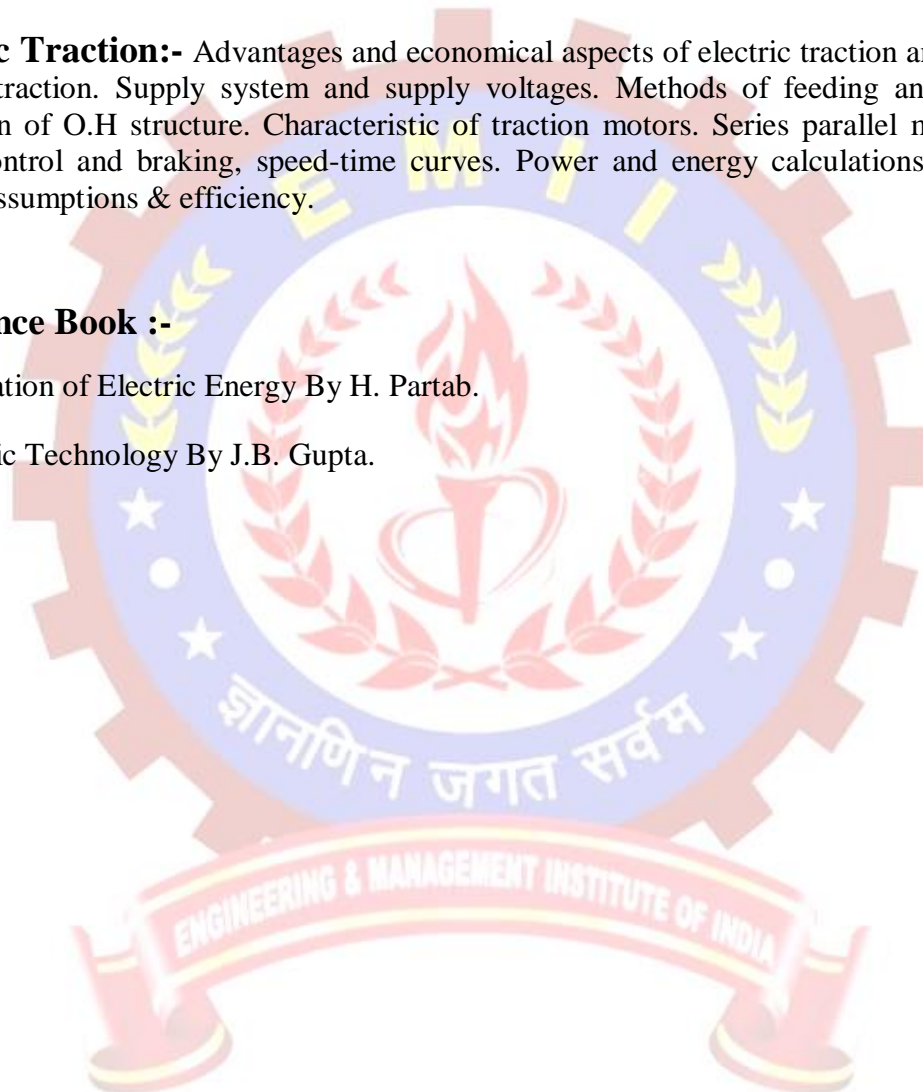
Electric Drives:- Advantages of electric drives. Characteristic of different types of loads. Electrical and mechanical characteristics of different types of motor speed control & braking. Selection of motors for specific purposes.

UNIT -V

Electric Traction:- Advantages and economical aspects of electric traction and diesel-electric traction. Supply system and supply voltages. Methods of feeding and current collection of O.H structure. Characteristic of traction motors. Series parallel method of speed control and braking, speed-time curves. Power and energy calculations, specific energy assumptions & efficiency.

Reference Book :-

1. Utilization of Electric Energy By H. Partab.
2. Electric Technology By J.B. Gupta.



Electrical Workshop (EEE-2.10)**UNIT-I**

Electronic materials:- Definition, properties and difference of conductor, insulator and semiconductor and its energy band diagram, Atomic structure of semiconductor, covalent bonds intrinsic and extrinsic semiconductor, P-type and N-type semiconductor their formation and properties, majority and minority carriers.

UNIT –II

Cables, Connectors and Switches:- CABLES General specifications of cables-characteristic impedance, current carrying capacity, flexibility. Types of cables – SWG Single core, Multi core, Single strand, Multi strand and their types, Armoured cable, Shielded wires, Coaxial cables, Twisted pair, Flat ribbon cable, Teflon coated wires, Fiber cables, optical Fiber Cable, CONNECTORS General specifications of connectors-contact resistance, breakdown voltage, insulation resistance, Constructional diagram, applications of BNC, D series, Audio, Video, printer, edge, FRC, RJ 45 connectors. Constructional diagram and applications of Phone Plug & Jacks, SWITCHES Toggle switch- SPDT, DPDT, TPDT, Centre off, Without centre off, Rotary switch types depending on their poles and positions Rocker switch, Push button latch and non latch, Tactile switch, Micro switch, Limit switch, DIP switch, Thumb wheel switch- BCD, Decimal, Membrane switch.

UNIT – III

Protective devices:- FUSES Glass, Ceramic fuse, Resettable fuse, Shunt fuse-MOV, HRC fuse, RELAYS construction, working and application of General purpose relay, NO, NC contact, Difference between switch & relay, MCB Construction working and applications.

UNIT – IV

Electrical and Electronics Components:- Resistors Resistors, classification of resistors, Materials used for resistors, maximum power rating, tolerance, temperature coefficient, Carbon film resistors, standard Wire wound resistors, Colour Coding, LDR , Capacitors Materials used for capacitors, working voltage, Capacitive reactance. Coding of capacitors Fixed Capacitor types: Disc, Ceramic capacitor, Aluminium electrolytic capacitor, Variable capacitor types: Air Gang,PVC gang capacitor, Trimmer mica capacitor, Transformers in electronic circuits Use of diodes and Special Diodes: Zener diode, Tunnel diode, Varactor diode, LED, photo diode, Schottky diode, PIN diode.

UNIT –V

Measuring instruments:- Front panel controls of Analog multimeter, Digital multimeter, CRO, Function generator, Checking of continuity, measurement of AC-DC voltage and resistance using Analog multimeter & Digital multimeter, Measurement of AC-DC voltage and resistance using CRO Measurement of time and frequency of AC voltage using CRO , Measurement of voltage, time and frequency of different types of wave with the help of CRO and Function generator.

Reference Book :-

1. Electrical Workshop Practice by Bawa.
2. Electrical Workshop Practice by A. K. Sarathe.

Estimating & Costing (EEE-2.11)**UNIT-I**

Electrical Wiring and IE Rules:- Types of wires, wiring system, Specifications of Different types of wiring materials, Accessories, Wiring tools. Wiring circuits, Domestic and industrial panel wiring. I.E. rules for wiring, IE Act-2003.

UNIT –II

Estimating, Costing and Contracting:- Estimation and estimation tools, Electrical Schedule of rates, catalogues, Survey and source selection, Recording estimates, Quantity and cost of material required, Purchase system, Purchase enquiry and selection of appropriate purchase mode, Comparative statement, Purchase orders, Payment of bills, Types of contract system, Tendering procedure and preparation of simple tender, Earnest Money Deposit, Security Deposit Schedule of rates (S.O.R.).

UNIT – III

III Estimating and Costing of Domestic and Industrial Wiring:- Layout for domestic Wiring, Load calculation, Cable selection, Earthing, Selection of switchgear, Overall Estimating and costing, Layout for domestic Wiring, Load calculation, Cable selection, Earthing, Selection of switchgear, Overall Estimating and costing, Mager and earth tester.

UNIT – IV

Estimation of Overhead Transmission Line, and Underground Distribution System:- Transmission lines, Line supports, Factors governing height of pole, Conductor materials, size of conductor for overhead Transmission line: cross arms, pole brackets and clamps, guys and stays, conductors configuration spacing and clearances, span lengths, overhead line insulators, insulator materials lightning arrestors, erection of supports, setting of stays, Earthing of lines, Guarding of overhead lines, Clearances of conductor from ground, Spacing between supports conductors, I.E. rules pertaining to LV Transmission lines.

UNIT –V**Estimating and Costing of Repairs and Maintenance of Electrical Devices and Equipment:-**

D.O.L. starter, small motor, monoblock pump, automatic electric iron, table/ceiling fan, ICDP/ICTP Switch, etc. Preparation of detailed drawing work of the product, Preparation of material quantity sheet for the product., Materials and cost required for maintenance work, Estimation of repairing cost and overall cost, Tools used for repairs & maintenance work Preparation of cost schedule for repair and maintenance of electric fan, automatic electric iron, single phase transformer, mixer grinder, D.O.L. Starter.

Reference Book :-

1. Electrical Estimation & Costing Engineering by K. B. Raina.
2. Electrical Estimation & Costing Engineering by M. A. Chaudhari.

C- Programming (EEE-2.12)**UNIT-I**

Computer Architecture:- Brief history, Charles Babbage Machine, Von Neuman Architecture, block diagram, memory & its different types, I/O devices, Role of O.S., computer languages, translator software, editor. Data, different types of data, information and its characteristics.

UNIT –II

Different number system:- decimal, binary, octal, hexadecimal number system, their conversion, 1's and 2's Complement, subtraction using complements. Different codes- ASCII, BCD, Ex-3, Gray. Conversion from Gray to binary and viceversa, BCD addition.

UNIT – III

Introduction to Operating System:- Definition, single user and multi-user OS, different function performs by OS, various popular OS like DOS, Windows, UNIX/LINUX. DOS and UNIX commands.

UNIT – IV

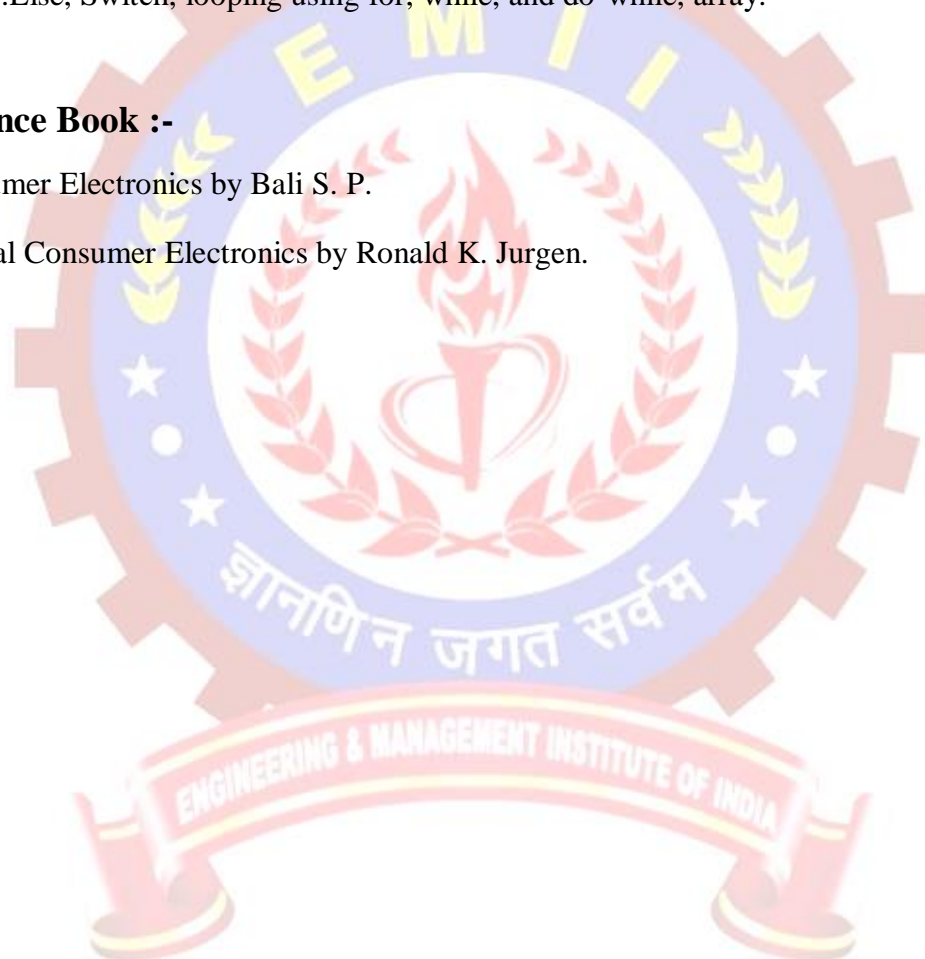
Computer Network and the Internet:- Definition, necessity of network, different types of network-LAN, MAN, WAN, network topology, transmission media, different network devices like NIC, hub, bridge, switch, gateway. Introduction to the internet, Internet services, browser, search engine

UNIT -V

Introduction to C programming:- Fundamentals of programming--Algorithm & Flowchart, source code and object code, Basic structure of C programs, Executing a C program, Constants, Variables, and data types. Operators and expression, Input Output function like printf, scanf, getchar, putchar, gets, puts, Decision making and branching using IF..Else, Switch, looping using for, while, and do-while, array.

Reference Book :-

1. Consumer Electronics by Bali S. P.
2. Digital Consumer Electronics by Ronald K. Jurgen.



Electronic Device & Circuit (EEE-2.13)**UNIT-I**

Multistage Amplifiers:- Need for multistage amplifier, Gain of multistage amplifier, Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth.

UNIT –II

Large Signal Amplifier:- Difference between voltage and power amplifiers, Importance of impedance matching in amplifiers, Class A, Class B, Class AB, and Class C amplifiers, collector efficiency and Distortion in class A,B,C,Single ended power amplifiers, Graphical method of calculation (without derivation) of output power; heat dissipation curve and importance of heat sinks. Push-pull amplifier and complementary symmetry push-pull amplifier.

UNIT – III

Feedback in Amplifiers:- Basic principles and types of feedback, Derivation of expression for gain of an amplifier employing feedback,Effect of feedback (negative) on gain, stability, distortion and bandwidth of an amplifier,RC coupled amplifier without emitter bypass capacitor, Emitter follower amplifier and its applications.

UNIT – IV

Sinusoidal Oscillators:- Use of positive feedback, Barkhausen criterion for oscillations,Different oscillator circuitstuned collector, Hartley, Colpitts, phase shift, Wien's bridge, and crystal oscillator. Their working principles (no mathematical derivation but only simple numerical problems) Tuned Voltage Amplifiers, Series and parallel resonant circuits and bandwidth of resonant circuits, Single and double tuned voltage amplifiers and their frequency response characteristics.

UNIT -V

Wave Shaping and Multivibrator Circuits:- General idea about different wave shapers, RC and RL integrating and differentiating circuits with their applications, Diode clipping and clamping circuits and simple numerical problems on these circuits. Multivibrator Circuits: Working principle of transistor as switch, Concept of multivibrator: astable, monostable, and bistable and their applications, Block diagram of IC 555 its working and applications. Opto Electric Devices: Working principles and characteristics of photo resistors, photo diodes, photo transistors, LED, LCD and Opto couplers.

Reference Book :-

1. Electronic Devices and Circuits by Millman and Halkias.
2. Electronic Circuit Theory by Boylestad.

POWER SYSTEM (EEE-2.14)**UNIT-I**

Power System – Introduction :- Introduction to Power System - Generation, Transmission & Distribution. Element of DC & AC distribution system – Radial and ring main distributor - Single fed, double fed.

UNIT –II

Insulators for Transmission Line :- Overhead line Insulator: need & types - Pin, Suspension, Strain, Shackle, Guy etc. Potential distribution - String efficiency - Methods of equalizing potential drop over string insulators.

UNIT – III

Overhead Transmission Line :- Overhead Transmission Lines Conductors. Transmission line parameters and their evaluations - Resistance, Inductance & Capacitance. Models of Short, Medium & Long Transmission Lines. Skin, Proximity and Ferranti effect. Power transfer capability of a transmission line.

UNIT – IV

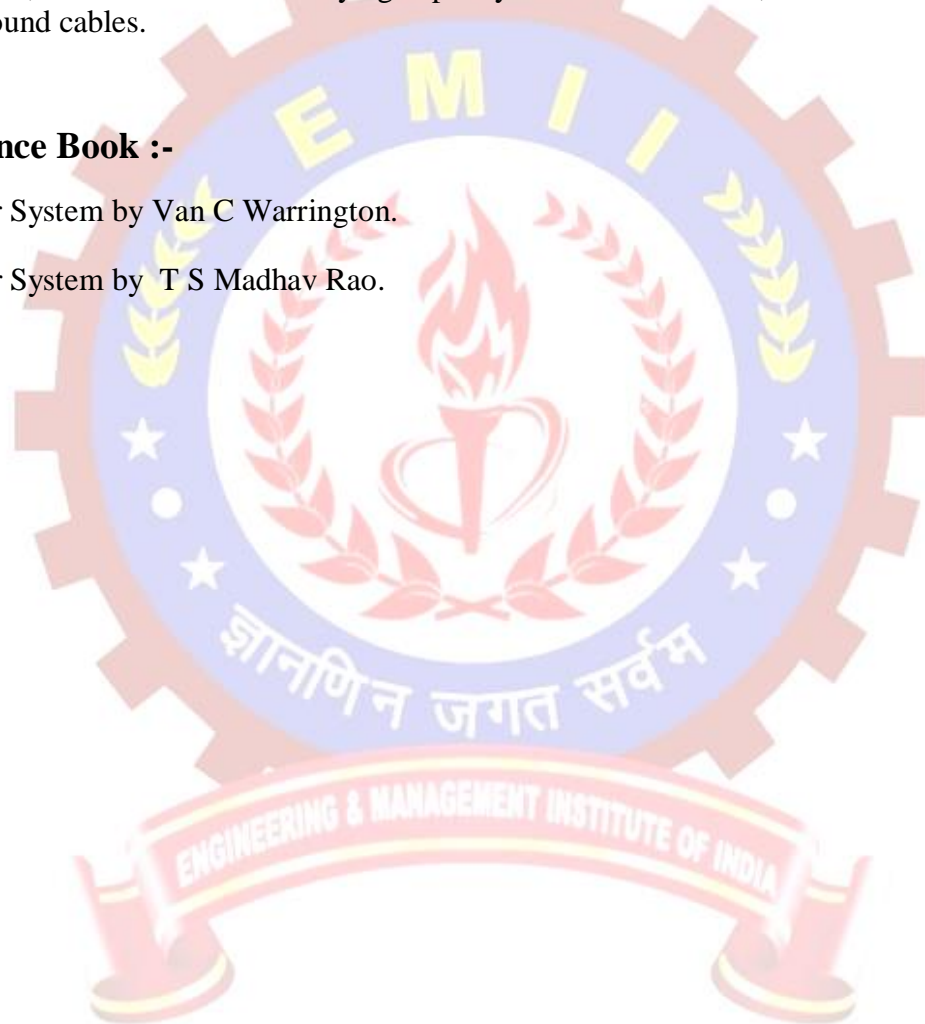
Design of Transmission Line:- Electric Power Transmission Towers. Sag evaluation and their calculations. Corona - Visual & Critical voltages - Corona loss - Effect of corona on line design practical considerations.

UNIT -V

Underground Cable :- Classification of cables, Cable conductors, Insulating materials, Insulation resistance, electrostatic stress, grading of cables, capacitance calculation, losses and current carrying capacity. Location of faults, methods of laying of underground cables.

Reference Book :-

1. Power System by Van C Warrington.
2. Power System by T S Madhav Rao.



Micro Controller (EEE-2.15)**UNIT-I**

Microcontroller:- Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin Diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.

UNIT –II

8051 Instruction Set:- Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instruction, Branch instructions, Bit manipulation instructions. Simple Assembly language program wxamples (without loops) to use these instructions.

UNIT – III

8051 Stack, I/O Port Interfacing and Programming:- 8051 Stack, Stack and Subroutine instruction. Assembly language program examples on subroutine and involving loops. Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status.

UNIT – IV

8081 Timers and Serial Port :- 8051 Timers and Counters- Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode-2 on a port pin. 8051 RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receivedata serially.

UNIT -V

8051 Interrupts and Interfacing Applications:- 8051 Interrupts. 8051 Assembly language programming to generate an external interrupt using a switch, 8051 C programming to generate a square waveform on a port pin using a Timer interrupt. Interfacing 8051 to ADC-0804, DAC, LCD and Stepper motor and their 8051 Assembly language interfacing programming.

Reference Book :-

1. Programming & Micro Controller Application by Ayala.
2. Programming & Micro Controller by Raj kamal.

Entrepreneurship Development & Management (EEE-2.16)**UNIT-I**

Introduction:- Meaning and Importance, Evolution of term 'Entrepreneurship, Factors influencing entrepreneurship, Psychological factors, Social factors, Economic factor, Environmental factors, Characteristics of an entrepreneur, Entrepreneur and Entrepreneur, Barriers to entrepreneurship.

Types of entrepreneur:- According to Type of Business, According to Use of Technology, According to Motivation, According to Growth, According to Stages, New generations of entrepreneurship viz. social entrepreneurship, Edupreneurship, Health entrepreneurship, Tourism entrepreneurship, Women entrepreneurship etc.

UNIT –II

Entrepreneurial Motivation:- Motivation, Maslow's theory, Herzberg's theory, McGrigor's Theory, McClelland's Need – Achievement Theory, Culture & Society , Values / Ethics , Risk taking behavior.

Creativity:- Creativity and entrepreneurship, Steps in Creativity, Innovation and inventions, Using left brain skills to harvest right brain ideas, Legal Protection of innovation, Skills of an entrepreneur, Decision making and Problem Solving (steps indecision making).

UNIT – III

Organisation Assistance:- Assistance to an entrepreneur, New Ventures, Industrial Park (Meaning, features, & examples), Special Economic Zone (Meaning, features & examples), Financial assistance by different agencies, MSME Act Small Scale Industries, Carry on Business (COB) licence, Environmental Clearance, National Small Industries Corporation (NSIC), Government Stores Purchase scheme (e-tender process),

Excise exemptions and concession, Exemption from income tax, Quality Standards with special reference to ISO, Financial assistance to MSME, Modernisation assistance to small scale unit, The Small Industries Development Bank of India(SIDBI), The State Small Industries Development Corporation(SSIDC), Export oriented units, Incentives and facilities to exports entrepreneurs, Export-Import Bank of India, Export oriented zone.

UNIT – IV

Rules And Legislation:- Applicability of Legislation, Industries Development (Regulations) Act, 1951., Factories Act, 1948, The Industrial Employment (Standing Orders) Act, 1946, Suspension, Stoppage of work, Termination of employment, West Bengal Shops and Establishment Act, 1963, Environment (Protection) Act, 1986, The sale of Goods Act, 1950, Industrial Dispute Act 1947.

Project Report:- Introduction, Idea Selection, Selection of the Product / Service, Aspects of a Project, Phases of a Project, Project Report, Contents of a Project Report, Proforma of a Suggested Project Report for a manufacturing Organization, Suggested Readings.

UNIT –V

Agencies for industrial assistance:- West Bengal Electronics Development Corporation, ICICI West Bengal Infrastructure Development Corporation, West Bengal Industrial Infrastructure Development Corporation, Other Corporations with focus as specific segments, State Industrial Development Corporation (SIDC), State Financial Corporation (SFCs), Directorate General of Supplies and Disposals(DGS & D), Registration with DGS & D, Registration Categories, Registration Procedure, Benefits of DGS & D, Information facilities centre in DGS & D, Khadi and Village Industries Commission (KVIC), Industrial Estate, Financing of Industrial Estates, Shilpabandhu-M Incentives for entrepreneurs 9reference to The West Bengal State Support for Industries Scheme 2008 & 2013.

Reference Book :-

1. Entrepreneurial Development, by S S Khanka.
2. The Entrepreneur, by Mark Casson.

Control System (EEE-2.17)**UNIT-I**

The Control System: - Open loop & closed control; servomechanism, Physical examples. Transfer functions, Block diagram algebra, Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback.

UNIT –II

Time Response analysis:- Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants Design specifications of second order systems: Derivative error, derivative output, integral error and PID compensations, design considerations for higher order systems, performance indices.

UNIT – III

Control System Components: - Constructional and working concept of ac servomotor, synchros and stepper motor.

Stability and Algebraic Criteria: - concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations.

Root Locus Technique: - The root locus concepts, construction of root loci.

UNIT – IV

Frequency response Analysis: - Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots.

Stability in Frequency Domain: - Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant M&N circles.

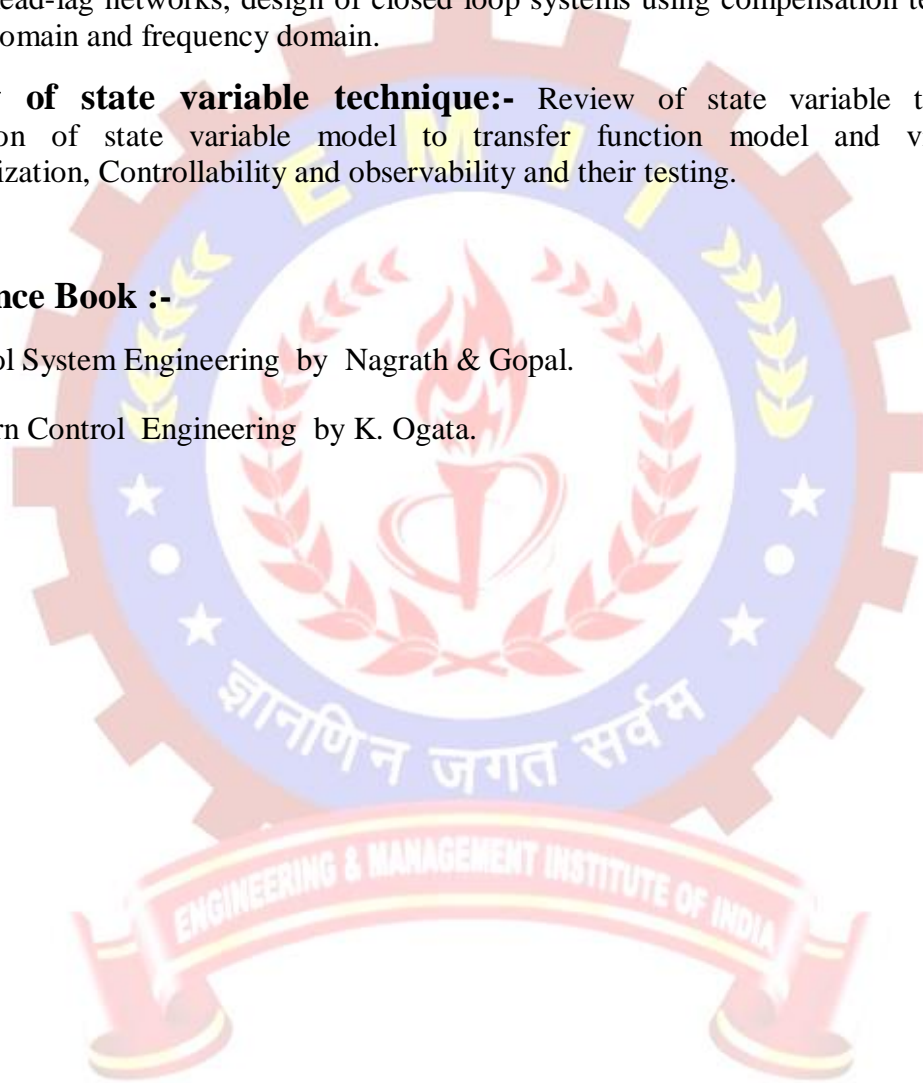
UNIT –V

Introduction to Design:- The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain.

Review of state variable technique:- Review of state variable technique, conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and observability and their testing.

Reference Book :-

1. Control System Engineering by Nagrath & Gopal.
2. Modern Control Engineering by K. Ogata.



Final year Project

Project (EEE-2.18)

Select any one topic:-

1. Induction Motor Controller and Protection System.
2. EV BMS With Charge Monitor and Fire Protection.
3. DIY Power Bank with Plasma Lighter.
4. Solar Wireless Electric Vehicle Charging System.
5. Ebike Speed Controller System.
6. Wearable Oscilloscope Smart Watch.
7. Contactless Switch For 4 Load Switching.
8. Smart Vehicle Headlight Auto Switching.
9. Contactless Gesture Controlled Study Lamp.
10. Earthquake Monitor and Alerting System.
11. Video Calling/Recording Smartphone Stand.
12. Solar Power Bank with Wireless Charging.