

Engineering and Management Institute of India

Diploma in Engineering

Electrical Engineering Syllabus

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Department of Electrical 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 Engineering.

Electrical & Electronics Engineering Material (EE-2.1)**UNIT-I**

D.C Fundamental and Circuits:- Ampere Volt and Ohm. Kirchoff's Laws, analysis of D.C. circuits with KCL and KVL. Resistance, grouping of resistors, temperature coefficient of resistance. Work, Energy and Power. Sample problems.

Semiconductor Physics and Diode:- Atomic structure and elementary concept of energy bands, conduction in crystal-absolute zero and above, intrinsic semiconductor, doping and extrinsic semiconductor, P-type and N-type semiconductor, PN junction, depletion layer, barrier potential, PN-Junction biasing, characteristics and break down mechanism (avalanche's and zener), working, characteristics and applications of LED and Zener diode.

UNIT –II

Rectifiers and Filters:- Concept of rectification, specification of a rectifier diode, single phase- half wave, full wave rectifiers: bridge and centre tap, circuits and their operations, calculation of ripple factor, efficiency of half wave and full wave rectifiers, concept of filtering and smoothing, filter circuits.

Magnetic Circuits, Elctro-Magnetc Induction and Capacitors:- Faraday's & lenz's law of electromagnetic induction. Induced and generated voltages. Inductance and its units, self and mutual inductances, energy stored in an inductor, capacitance and it's unit, grouping of capacitors, energy stored in a capacitor. Magnetic Circuit: associated terms and their units, simple problems on series and parallel Magnetic circuits.

UNIT – III

Alternating Currents Fundamentals:- Concept of alternating quantities, instantaneous, Average & R.M.S value. nature of alternating voltage and current. Sinusoidal equation, phasor diagram, lagging,leading quantities.

Electronic Components:- Active and passive components, resistors and their types: fixed value and variable resistors, resistor colour coding, capacitors and their types: fixed value and variable capacitors, inductors, types of inductors: filter chokes, radio frequency chokes and variable inductors.

UNIT – IV

Transistors:- Bipolar Junction Transistors: construction, types and operation, Basic BJT amplifier configuration: common emitter, common base and common collector, input and output characteristics, current amplification factor for different configurations. Field - Effect Transistors: structure, principle of operation and V-I characteristics of JFET and MOSFET, voltage transfer characteristics.

Power In A Single Phase A.C. Circuit:- Power in an a.c circuit, power factor, active and reactive currents. Relationship between current and voltage in purely resistive, inductive and capacitive circuits, inductive and capacitive reactance.

UNIT –V

Three Phase Circuits:- Generation of three phase voltages, phase sequence, star and delta connections, line and phase values, phasor diagrams, power in a three phase balanced and Solution of three phase balanced circuits.

Transistor Amplifiers:- Class of operation: A, B, AB and C, small signal operation, operating point and load line, biasing and stabilization of transistor, Biasing the BJT: fixed bias, emitter feedback bias, collector feedback bias and voltage divider bias.

Reference Book: -

1. Electronics Devices & circuits by Bogart.
2. Principles of Electrical Engineering by V.K. Mehta.

Electrical Measurement & Measuring Instrument (EE-2.2)**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.



Digital Electronics-I (EE-2.3)

UNIT-I

Introduction of Number System & Codes: - Distinction between analog and digital signal. Applications and advantages of digital signals. Need and process of A/D and D/A conversion, Binary and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa. Binary addition, subtraction, multiplication and division including binary points. 1's and 2's complement method of addition/subtraction, sign magnitude method of representation, floating point representation, Concept of code, weighted and non-weighted codes, examples of 8421, BCD, excess-3 and Gray code. Concept of parity, single and double parity and error detection Alpha numeric codes: ASCII and EBCDIC.

UNIT-II

Logic Gates and Simplification: - Concept of negative and positive logic, Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, NAND and NOR as universal gates. Postulates of Boolean algebra, De Morgan's Theorems. Various identities. Formulation of truth table and Boolean equation for simple problem. Implementation of Boolean (logic) equation with gates, Karnaugh map (upto 4 variables) and simple application in developing combinational logic circuits Logic Families: Logic family classification: Definition of SSI, MSI, LSI, VLSI- TTL and C MOS families and their sub classification- Characteristics of TTL and C MOS digital gates. Delay, speed, noise margin, logic levels, power dissipation, fan-in, power supply requirement and comparison between TTL and C MOS families Logic Circuits:-Open collector, wired OR and totem pole output circuit operation (qualitative) for a TTL NAND gate- C MOS circuit operation for a standard gate (NOR).

UNIT – III

Arithmetic Circuits, Coders and Decoders:- Half adder and Full adder circuit, design and implementation. Half and Full subtracter circuit, design and implementation. 4 bit adder/subtracter. Adder and Subtract or IC (7484), Encoders and Decoders: Four bit decoder circuits for 7 segment display and decoder/driver ICs. Multiplexers and Demultiplexers Basic functions and block diagram of MUX and DEMUX. Different types and ICs

UNIT – IV

Latches and flip flops and Counters:- Concept and types of latch with their working and applications, Operation using waveforms and truth tables of RS, T, D, JK, and Master/Slave JK flip flops. Difference between a latch and a flip flop, IC flip flops Counters: Binary counters, Divide by N ripple counters (including design), Decade counter. Pre settable and programmable counters, Down counter, up/down counter, Synchronous counters (only introduction). Difference between Asynchronous and Synchronous counters, Ring counter with timing diagram, Counter ICs.

UNIT – V

Shift Register and Memories:- Introduction and basic concepts including shift left and shift right. Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out. Universal shift register, Buffer register, Tristate Buffer register IC 7495. Memories: Basic RAM cell, $N \times M$ bit RAM, Expansion of word length and capacity, static and dynamic RAM, basic idea of ROM, PROM, EPROM and EEPROM.

Reference Book :-

1. Digital Electronics-I by RP Jain.
2. Digital Electronics by KS Jamwal.

Transmission & distribution (EE-2.4)**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

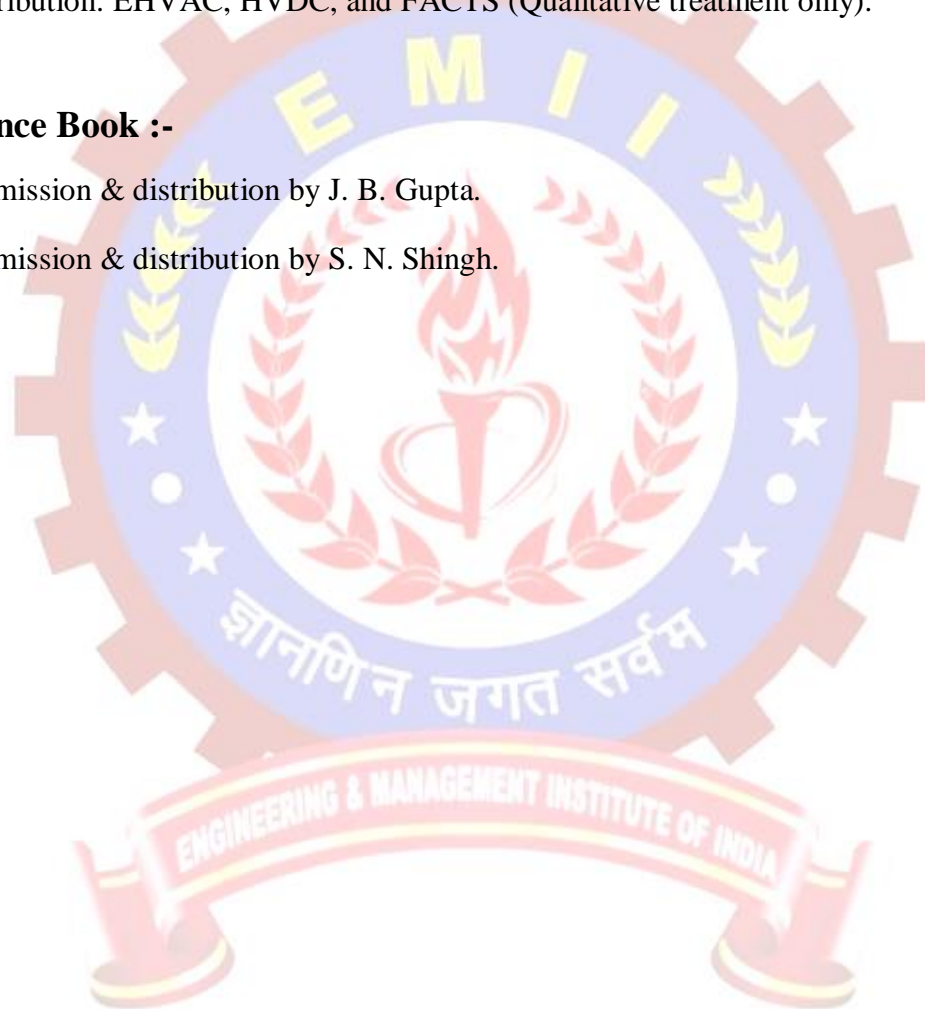
Under Groung Cabilitys:- Underground cabilitys- Types of cabilitys- Construction of single core and 3 core Cabilitys- Insulation Resistance- Potential Gradient-Capacitance of single- core and 3 core cabilitys- Grading of cabilitys- Power factor and heating of cabilitys- DC cabilitys.

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.



Computer Programming & Application (EE-2.5)**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

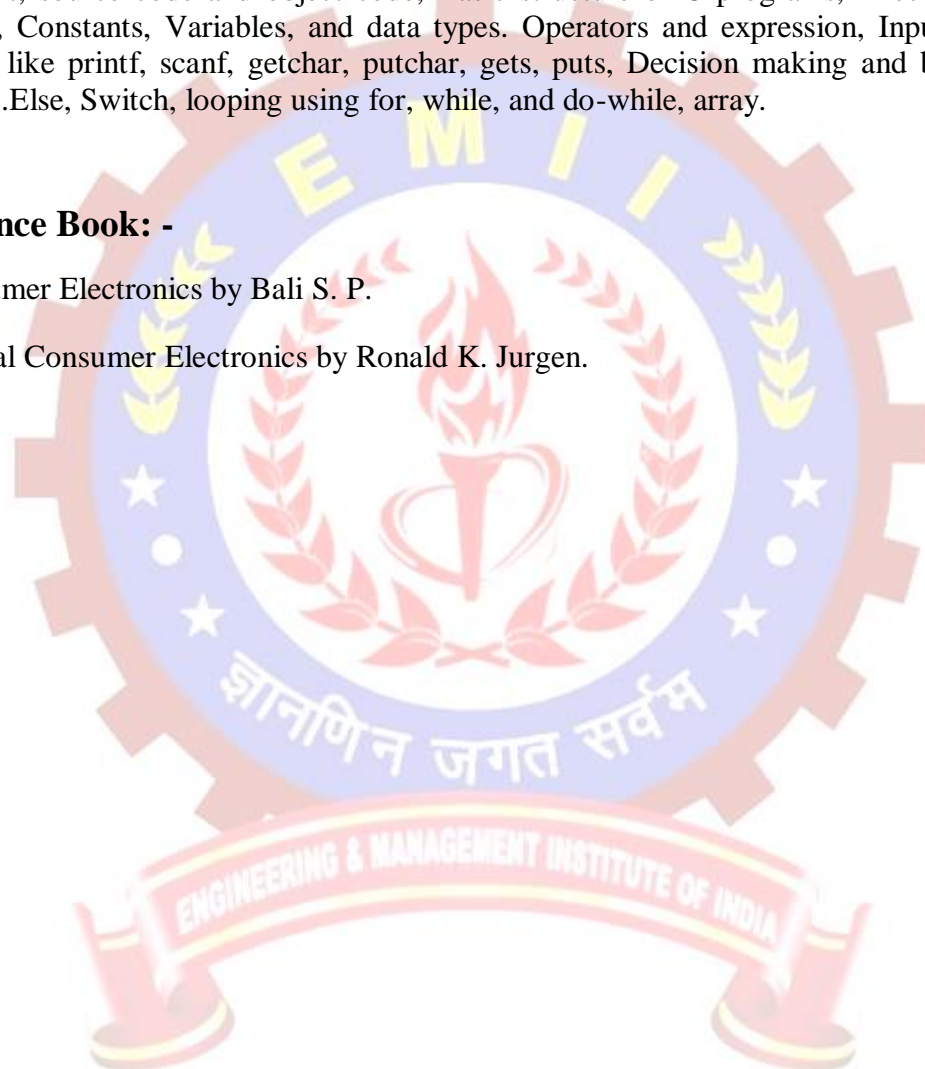
Computer Network and the Internet:- Definition, necessity of network, different types of network-LAN, MAN, WAN, network topology, transmission media, different network devices like NIC, hub, bridge, switch, gateway. Introduction to the internet, Internet services, browser, search engine

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.



Electrical Machine-I (TMEE-2.6)**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.

Electrical Workshop Practice (EE-2.7)**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.

Electrical Instrumentation (EE-2.8)**UNIT-I**

Data Transmission and Telemetry:- Data transmission systems, advantage and disadvantages of digital transmission, pulse modulation, digital modulation, and pulse code format, modems, IEEE-488 bus, RS-232 interface, opto-isolator.

UNIT –II

Data Acquisition Systems:- Sample-Hold circuits, multiplexing-time division and frequency division, demultiplexing, objective of a DAS, single-channel and multi-channel DAS and their configurations, Data Loggers- basic operation and block diagram.

UNIT – III

Miscellaneous Instruments:- Digital measurement of frequency (mains), digital measurement of high frequency, digital pH meter, digital capacitance meter, digital tachometer, measurement of power using Bolometer.

UNIT – IV

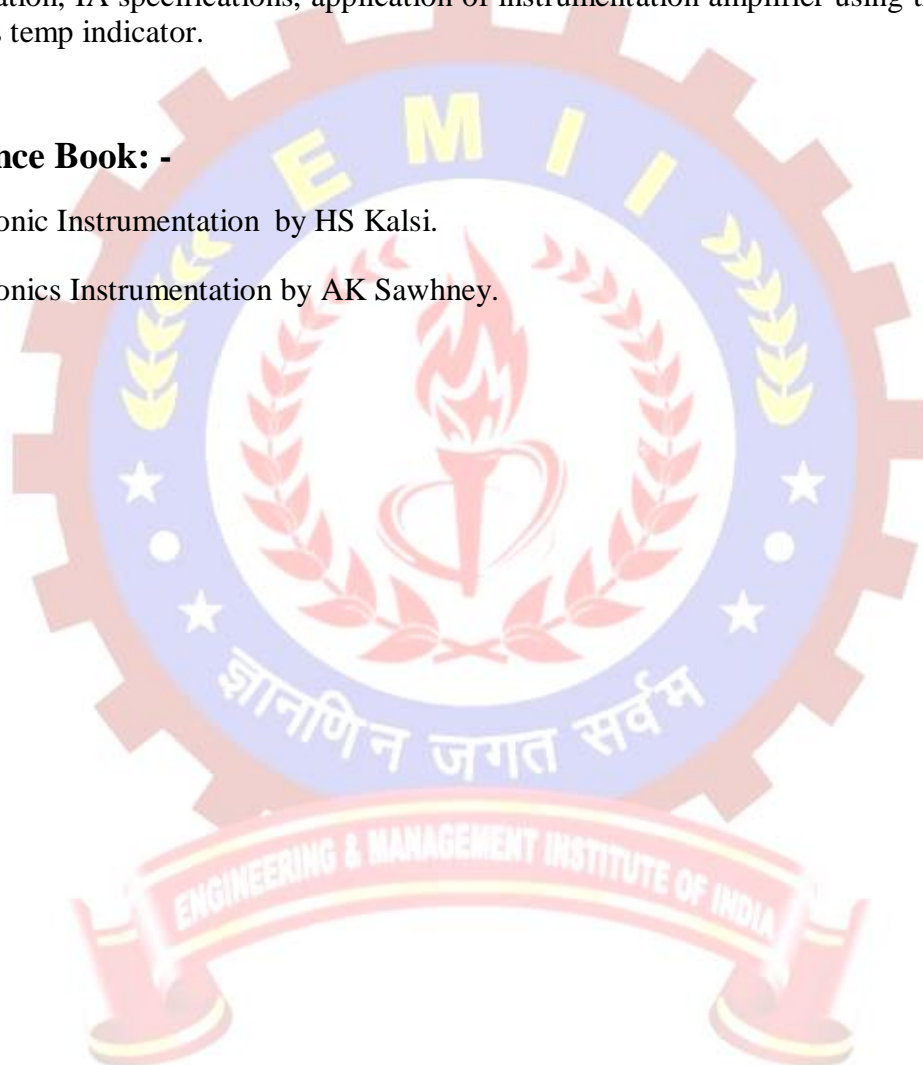
Display Device and Recorders:- LEDs, LCDs, seven segment and dot matrix displays, Electro luminescent, electrophoretic image and liquid vapour displays, printers-dot matrix, ink-jet, laser jet printer, recorders-Potentiometric, X-Y recorders.

UNIT –V

Signal Conditioning:- Signal conditioning- ac and dc signal conditioning, comparators, current-to-voltage and voltage-to-current converter, attenuators, A to D and D to A converters, instrumentation amplifiers(IA)-single op-amp and three op-amp configuration, IA specifications, application of instrumentation amplifier using transducer bridge as temp indicator.

Reference Book: -

1. Electronic Instrumentation by HS Kalsi.
2. Electronics Instrumentation by AK Sawhney.



Estimation & Costing of Electrical Engineering (EE-2.9)**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, Magger 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.

Electrical Power-I (EE-2.10)**UNIT-I**

Supply System:- Component of electrical energy system from generating station to consumers. Comparison of conductor cost in various systems. Advantages of high voltage transmission. Advantages of interconnection. Economic of power improvement.

UNIT –II

Conductor and Power Cables: - Types of conductors. Equivalent copper section. Kelvin's law. Comparison of over head/under- ground systems. Power cable construction. Oil-filled, gas-pressure and SF₆ gas cables.

UNIT – III

Mechanical Characteristics: - Types of insulators. Voltage distribution & string efficiency. Improvement of voltage distribution. Line supports. Parabolic method of sag calculation at level supports. Ice and wind loading of conductors. Factors affecting sag.

UNIT – IV

Performance of Lines:- Line parameters. Expression for line inductance and line capacitance. Performance of short and medium lines. Nominal Tee and π -methods of calculation of voltage regulation and efficiency. Elementary idea of Long Transmission Line.

UNIT –V

Corona and H.V.D.C. Transmission:- Phenomena of corona. Factor affecting corona. Disruptive Critical and visual critical voltages. Corona power loss. Minimizing corona. Component of an HVDC transmission system. D.C. systems. Applications of

HVDC systems. Limitation of A.C. transmission. Economic Comparison. Advantages and limitation of HVDC transmission. Classification of HVDC links.

Reference Book: -

1. Electrical power system by Ashfaque Hussain.
2. Electrical power system Analysis by Nagrath & Kothari.



Industrial Electronics & Control of Drives (EE-2.11)**UNIT-I**

Introduction of Electrical Control of Machines:- Manual control – Magnetic control – Semi-automatic and Automatic control of Modern machinery – Development of Control circuits–Two wire and Three wire control – Remote control – Interlocking of drives – Control circuit components –Symbols for control components–Fuses, Switches and Fuse Switch units.

UNIT –II

Protection of motors :- Moulded– Case Circuit Breaker (MCCB) and Miniature Circuit Breaker (MCB) –Contactors – Types of contactors – Contactor ratings, Relays – D.C Series current relay – Frequency responsive relay – Latching relay – Over load relays – Bimetallic Thermal over load relay – time delay relay (Timers) – Motor drivers Electronic timer – Phase failure relay – Push button switches – Types, Limit switch – Float switch.

UNIT – III

Control of Three-Phase Induction Motors:- Motor current at start and during acceleration – Automatic starters – Increment Resistor type starter – Automatic Autotransformer starter – Open circuit and closed circuit transition – Part winding motor starters Two step and Three step starting – Automatic Star-Delta starters Open circuit and closed circuit transition – Starters for multi-speed motors. Starters for Wound rotor motors – Control circuit using contactor and flux delay relays.

UNIT – IV

Control of Synchronous Motors: - Manual Push button synchronizing Starter, Timed Semi-Automatic Synchronizing, Automatic Starter using Polarised Field Frequency Relay.

Control of D.C motors:- Principles of acceleration – Types of starters for automatic acceleration – Control circuits for DCL, Current limit acceleration starters – Reviewing of D.C motors – Control circuit for direct reversing and forward stop reverse operation – Jogging operation of D.C motor – Control circuits for braking action.

UNIT –V

Control of stepper motors:- Control circuit for Stepper motor – Block diagram of a typical step motor control – Types of drive circuits – simple power drive circuit – L/R drive Bi-level drive – Chopper drive – Linear constant current drive – Bipolar drives for Stepper motor – H type and L/R type bipolar drives – Bipolar Chopper drives. Trouble shooting in control circuits – Trouble spots –General procedure for trouble shooting.

Reference Book :-

1. A Textbook of Electrical Technology by BL Theraja.
2. Modern Power Electronic and AC Drives by Bimal K. Bose.

Digital Electronics & Microprocessors (EE-2.12)**UNIT-I**

Introduction:- Microprocessors – evolution, importance and Application.

Architecture of a Microprocessor – 8085:- Concept of bus and bus organisation, Functional block diagram and function of each block, Pin details of 8085 and related signals, Demultiplexing of address/data bus and memory read/write cycles.

UNIT –II

Instruction Set for Intel 8085:- Instruction and data format – opcode and operand and its word size, Instruction cycle, machine cycle, T-states, fetch cycle, and execute cycle, Different addressing modes, Status flags and their importance , Data transfer, arithmetic and logical operation, branching, and machine control instructions, Use of stacks and subroutines, Assembly language programming

UNIT – III

Interfacing and Data Transfer Schemes:- Memory mapped I/O and I/O mapped I/O schemes, Interrupts of 8085, Programmable data transfer, DMA data transfer and interrupt driven data transfer schemes with their applications. Different postulates and De-Morgan's theorems in Boolean algebra, Use Of Boolean Algebra For Simplification Of Logic Expression, Karnaugh Map For 2,3,4 Variable, Simplification Of SOP And POS Logic Expression Using K-Map.

UNIT – IV

Basics of Digital Electronics:- Binary, Octal, Hexadecimal number systems and compare with Decimal system. Binary addition, subtraction, Multiplication and Division. 1's complement and 2's complement numbers for a binary number, Subtraction of binary numbers in 2's complement method. Use of weighted and Un-weighted codes & write Binary equivalent number for a number in 8421, Excess-3 and Gray Code and vice-versa.

Importance of parity Bit, Logic Gates: AND, OR, NOT, NAND, NOR and EX-OR gates with truth table. Realize AND, OR, NOT operations using NAND, NOR gates.

UNIT –V

Combinational Logic Circuits:- Give the concept of combinational logic circuits. Half adder circuit and verify its functionality using truth table. Realize a Half-adder using NAND gates only and NOR gates only. Full adder circuit and explain its operation with truth table. Realize full-adder using two Half-adders and an OR – gate and write truth table Full subtractor circuit and explain its operation with truth table. Operation of 4 X 1 Multiplexers and 1 X 4 demultiplexer Working of Binary-Decimal Encoder & 3 X 8 Decoder. Working of Two bit magnitude comparator.

Reference Book :-

1. Digital Electronics & Microprocessors by A.K Chhabra.
2. Digital Electronics & Microprocessors by Anil K. Maini.

Utilization Of Electrical Engineering (EE-2.13)**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

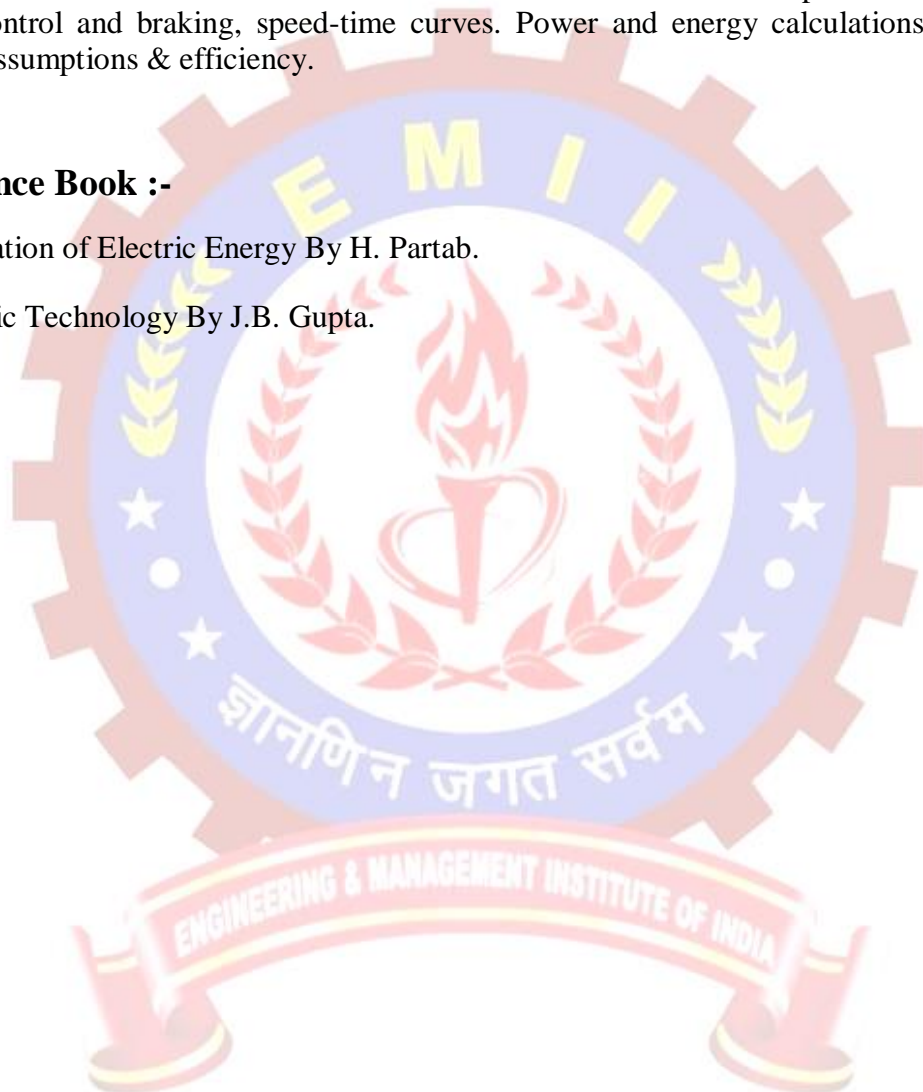
Electric Drives:- Advantages of electric drives. Characteristic of different types of loads. Electrical and mechanical characteristics of different types of motor speed control & braking. Selection of motors for specific purposes.

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.



Programming & Micro Controller (EE-2.14)**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.



Installation & Maintenance of Electrical Equipments (EE-2.15)

UNIT-I

Installation testing and maintenance :- Types of heavy Electrical equipment, unloading accessories precautions for unloading, installation of small and large machines of both static and rotating type. Installation of pole mounted transformer. Instruments used for measuring insulation resistance, reasons for deterioration of insulation resistance, improving insulation resistance, drying of insulation, Measurement of internal temperature of winding, vacuum impregnation / filtering of insulating oil, testing of insulating oil.

UNIT –II

Commissioning :- Tests required before commissioning procedure to be adopted for commissioning the electrical equipment in respect of -Mechanical fixture and alignment. Electrical tests. Initial precautions for starting.

UNIT – III

Preventive maintenance and environmental pollution prevention :- Concepts of preventive maintenance, advantages, preventive maintenance schedule for transformer, induction motor, transmission line, circuit breaker and underground cable. Preventive measures to control environmental pollution results due to production of smokes gases flow of waste material and automatic reactions in research stations, plants, electrical and electronic equipments and accessories.

UNIT – IV

Trouble Shooting:- Normal performance of equipment, trouble shooting internal and external faults, instruments and accessories for trouble shooting, trouble shooting charts.

Electrical Accidents and Safety Measures: - Electrical accidents, Safety regulations, treatment of shock, fire extinguishers.

Earthing: - Reasons of earthing, earthing system, earth lead and its size, permissible earth resistance for different installations, improvement of earth resistance, double earthing, earth resistance measurement, rules for earthing.

UNIT -V

Testing and maintenance of Relays and Circuit Breakers :- Testing of Relays Factory test, commissioning test and preventive periodic maintenance test. Testing of circuit breakers, voltage test, type test, preventive maintenance of circuit breaker.

Hot Line Maintenance:- Meaning and advantages, special types of non-conducting Materials used for tools for hot line maintenance.

Reference Book: -

1. Fundamentals of maintenance of Electrical Equipment by Bhatia Khanna.
2. Electrical Maintenance & Repair by J.I. Watts.

Entrepreneurship Development & Management (EE- 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, McGregor'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 reference 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.

Energy Source & Management of Electrical Energy (EE-2.17)**UNIT-I**

Energy Resources:- Energy and Development, Units and Measurements, Conventional and Non-Conventional Sources of Energy, Fossil and Mineral Energy Resources, Details of Coal, Peat, Oil, Natural Gas and Nuclear Resources, Recovery of Fossil Fuels, Classification and Characterization of Fossil fuels, Basic of Solar, Wind, Bio, Hydro, Tidal, Ocean Thermal and other Renewable Energy Sources, Impact of Energy on Environment, Flow of Energy in Ecological System, Environmental Degradation due to energy, Control of Pollution from Energy.

UNIT –II

Energy Management:- Fundamental of Energy conservation, Energy Management and Audit, Basics of Energy Demand and Supply, Principles of Economic analysis in the Energy Management and Audit Programme, Supply side and demand side energy management, Boilers and Firing System, Steam, Condensation Systems, Energy Conservation and Management in power plant, Energy conservation in Buildings, Heating, Ventilation and Air Conditioning System, Degree day in energy use monitoring, Energy Conservation Opportunities, in chemical industries, Waste heat recovery, Co-generation, Energy Conservation in Agricultural Sector, Energy conservation in illumination engineering, Combustion stoichiometry, air-fuel ratio, optimum loading in boilers, etc.

UNIT – III

Industrial Energy Analysis:- Materials and energy balance in the industries, Products and the process, industrial demand and supply networking, Optimization techniques, efficiency analysis, methods, Energy monitoring and ongoing information dissertation in terms of energy consumption, production and cumulative sum of differences. Energy efficiency analysis in various conversion systems like boilers, furnaces, compression systems, controlling systems, etc. Case studies for larg scale, medium scale and small scale industries, efficiency integration methodologies.

UNIT – IV

Power Systems Engineering:- Basic concept of power plants, types of power plants, thermal power stations, various components of thermal power stations, power plant cycles, fuel handling, combustion, waste disposal methodologies, economizers, turbo alternators, heat balance and efficiencies, hydroelectric power plant, various components, capacity calculation, design methodologies, operation and maintenance methodologies, elements of nuclear power stations, reactor design, fuel, moderator, coolant control and safety, waste disposal.

UNIT –V

Energy Conversion Systems:- Energy resources, Energy conversion processes and devices – Energy conversion plants – Conventional - Thermal, Hydro, Nuclear fission , and Non – conventional – Solar, Wind Biomass, Fuel cells, Magneto Hydrodynamics and Nuclear fusion. Energy from waste, Energy plantation.

Reference Book: -

1. Energy Management Handbook by Wayne C. Turner, Steve Doty.
2. Energy Management & Conservation, by Frank Kreith, George Burmeister.

Final year Project

Project (EE-2.18)

Select any one topic:-

1. Projects connected with repair and maintenance of machines.
2. Estimating and costing projects.
3. Design of jigs / fixtures.
4. Projects related to quality control.
5. Project work related to increasing productivity.
6. Projects relating to installation, calibration and testing of machines.
7. Projects related to wastage reduction.
8. Project, related to fabrication.
9. Energy efficiency related projects.
10. Projects related to improving an existing system.