NIELIT, AURANGABAD
Dr. B.A.M.U. CAMPUS
AURANGABAD, 431004

DIPLOMA IN ELECTRONICS PRODUCTION & MAINTENANCE

MODIFIED SYLLABUS

WITH EFFECT FROM 01 st JULY 2012

English (Code : DT 101)
Theory   **2 hrs/wk**

LISTENING, READING AND COMPREHENSION : Comprehension of class room lectures in English, discrimination of words groups in lectures, oral expression of Psalient points in the lecture and arrangements of bits of information in logical order.

COMPREHENSION OF WRITTEN ENGLISH IN TEXT BOOKS AND REFERENCE BOOKS OF THE COURSE : Meanings of key words in any chapter, arrangement of ideas in a proper order, comparison and discrimination of different ideas in any chapter and meaning of portions of sentences and whole sentences.

IDIOMS AND PHRASES USED IN TECHNICAL LITERATURE : Meaning of technical and scientific terms, relation between meanings of words and their function, words which give specific meaning in certain situations, ten phrases giving meanings, different from those of constituent words and the usage of the above ten idioms and phrases in suitable contexts.

GRAMMATICALLY CORRECT CONTINUOUS PASSAGE WITH SUITABLE CONNECTIVE DEVICES : Identification of structural functions of words in various sentences, variations of word order to effect best communication with five examples in choosen contexts. Filler type sentences and their constructions practicing the use of model verbs. Link words between any two sentences and writing continuous paragraphs.

TWO ENGLISH LECTURES ON SPECIAL TECHNICAL TOPICS : Listing from those of constituent words and the usage of the above ten idioms and phrases in suitable contexts.

GRAMMATICALLY CORRECT CONTINUOUS PASSAGE WITH SUITABLE CONNECTIVE DEVICES : Identification of structural functions of words in various sentences, variations of word order to effect best communication with five examples in choosen contexts. Filler type sentences and their construction, practising the use of model verbs. Link words between any two sentences and writing continuous paragraphs.

TWO ENGLISH LECTURES ON SPECIAL TECHNICAL TOPICS : Listing key words in the given lectures, statement of main ideas of the lecture and choice of correct statement from the given list. Analysis of the process of definition, description and conditional inference used in experimental situations. Arrangement of sentence parts to form a definition, arrangement of facts to make a language of description and arrangement of points to form an inference.
PARTICIPATION AND ORAL COMMUNICATION IN PROFESSIONAL SITUATIONS LIKE SEMINARS AND MEETINGS : Group discussions on technical topics and participation in seminars.

WRITING OF TECHNICAL REPORTS : Arrangement of data as per their propriety, consolidation and preparation of reports from the data.

Reference Books :
1. English communication : Technical Teachers Training Institute, Madras Oxford University Press.
2. Living English Speech : Standard Allen Orient Longman.
3. Modern Business Letter Writing : J. S. Bright.
4. English Pronunciation Dictionary.

Mathematics-I (Code : DT 102)

Theory   **3 hrs/wk**

ALGEBRA :Quadratic equations and their solutions; A.P. and G.P. series, matrices and determinants and their applications metrics methods of solutions of simultaneous equations complex numbers – modules, amplitude, conjugate of complex number number, Argand's diagram, vectors : addition and subtraction of a vectors, dot and cross/vector products of two vectors, binomial theorem.

CO-ORDINATOPR GEOMETRY : Equation of a straight line in a plane; distance between two points on straight line, equation of a line passing through two points, intersection of straight lines, parallel lines, perpendicular to a straight line, equation of a circle, finding center and radius, shifting of origin or coordinate axes; problems, equation of a parabola, focus directrix, symmetry about X or Y axes. Problems, equation of general and rectangular hyperbolas problems.

TRIGONOMETRY : Measurement of angle, trigonometric ratios, values and identities, compound multiple and submultiples angles and their ratios, height and distance sine consine tangena curves and applications, log/log and semi log graph.

Physics – I (Code : DT 103)

Theory   **3 hrs/wk**

UNIT – 1 : Introduction; What is physics? Scope and excitement of physics, physics and technology, Measurement – Units, system in unit, Abbreviation in powers of 10, length some length measurements, mass, time, other base units, Dimension and dimensional analysis, Accuracy, precision of instruments and errors in measurements.

UNIT – 2 : Laws of motion Introduction, objects in motion and in a straight line, uniform and non uniform motion. Force and inertia, Newton's Laws of motion.

UNIT– 3 : Work energy and power work, kinetic energy, potential energy, collisions, different forms of energy and conservation of energy.

UNIT– 4 : Gravitation introduction, the centre of mass, two particle system. Rigid body and rotational motion. Torque and angular momentum for a system of particles. Rotational motion and the moment of inertia, some examples of two dimensional rigid body motion. Rigid body motion in three dimension.

UNIT– 5 : Properties of matter Solids : Crystalline and glassy solids, elasticity. Fluids : Pressure, atmospheric pressure, buoyancy and Archimedes principle, viscosity fluid flow; Liquid : surface tension; Gases : Pressure, volume and temperature, kinetic theory of gases.

UNIT– 6 : Heat and thermo dynamics Introduction, temperature, thermal expansion, energy, heat and specific heat, first law of thermo dynamics, Heat engine and second law of thermodynamics, transfer of heat.

LAB SESSIONS   **3hrs/wk**

Inclined Plane, Screw, The coefficient of friction (static and dynamic), Simple pendulum Sonometer, resonance tube, Newtons law of cooling, Boyles law, Travelling microscope (R.I. of glass and liquid), Spectrometer (R.I. of prism), Measurement of viscosity, The law of moments, The law of parallelogram, Determination of wavelength of sound, Measurement of humidity.

References Books:
1.Engineering Physics by R. K. Gaur and S. L. Gupta.
2.Physics : Foundation and Frontiers by George Gamoe.
3.A Text Book of Science for Technicians : TTTI, Madras.
4.A Text Book of physics by Gambhir and Kulkarni.

Chemistry– I (Code : DT 104)

Theory   **3 hrs/wk**

Introduction : Chemistry – Definition and scope. Matter : Homogeneous and Heterogeneous, Elements, Compounds and Mixtures, Mole concept, Problems (Avagadro Number) Law of Conservation of mass. Law of constant composition. Law of multiple composition. Gay Lussac's Law of combining volumes. Boyle's law, Charles' law, Combined gas laws problems.

Structure of Atoms : Atoms and Atomic structures. Atomic Weight and Number, Isotopes, Isobars. Atomic symbols. Electronic configuration, Bohr's models. Energy levels.PERIODIC TABLE : Modern Periodic Table : Developments and Uses. Electro negativity, Electro positivity, Metals, Non Metals, Insulators, Conductors, Semiconductors, Analysis of Periodic table.

Chemical Bonds: Valent electrons, convelent bond ionic bond Cysteal lattices metallic bonds, lattices energy.

Chemical Equation: Determination of chemical formula. Writing of simple equations balancing of chemical equation.

Chemical Reaction: Thermo chemistry. Heat of transition, Rate of reactions. Factors affecting reaction rate. Le Chatelier;s principal. Catalysts : Homogenous, Heterogenous. Mechanism of catalysis. Chain reactions. Reversible, Irreversible. Chemical equilibrium, displacement of chemical equilibrium.

Solutions : Solution, Solutes, Solvents, Saturated and unsaturated, water as solvent. Hydrates, Solubility, Super saturated solution. Osmosis & diffusion.

Solution of Electrolytes : Electrolytes dissociation, ionic equation, ionic equilibrium, Strong and weal electrolytes. Properties of acids, bases and salts, Neutralisation, Titration, Indicators, PH Value, Buffer solution, Normal, Acidic and basic salts, Double salts, Hydrolysis.

Reference Books:
1. Chemistry : A Conceptual Approach   Mortimer.
2. General Chemistry : N. l. Glinka Vol. 1 & 2.
3. Engineering Chemistry : P. C. Jain & Monika Jain

Electrical Technology – I (Code : DT 105)

Theory   **3 hrs/wk**

Introductory Concepts : Units & dimensions, Electrical current & voltage, the concept, electrical resistance, Ohms law, Effect of temperature on resistance of conductors, chemical effect of current, concept of emf, heating effect of current, electric power and energy.

Electric circuits : Series & parallel connections of resistances, KVL, KCL, standard methods of network analysis, Thevenins theorem, superposition theorem, star/delta & delta star conversion techniques.

Magnetism & electromagnetism : Concept of magnetic flux, magnetic field strength, permeability of the materials, magnetic field due to a current carrying conductor/solenoid, magnetic circuits, mmf. Force on conductor, Biot-Savert's Law, Lorenz law, dipole.

Energy storing elements :Electromagnetic induction : Faraday's law Lenz's law, induced emf, concept of inductance (self/mutual), its basic electrical property (V-I relation)

Electrostatics : Coulombs law, concept of electric field, permittivity, dielectric materials, capacitor as a charge storing element, capacitance of a parallel plate capacitor, capacitors in parallel/series, capacitance of a cylindrical capacitor, Dipole, Gausse's Theorem.

Reference Books:
1. Electrical Technology : B.L. Theraja

Workshop Technology – I (Code : DT 106)
Theory   **2 hrs/wk**

Introduction : Workshop Rules, safety Precautions and First Aid Procedures.

Engineering Materials : General ideas of Extraction of common engineering metals, their properties and applications.

Basic Manufacturing Process : Introduction to various casting, Hot working and Cold Working processes.

Workshop Tools And Operations : Types, Construction uses care and Maintenance of :-

Hand Tools : Vices,Hammers,Screwdrivers,Pliers,Wrenches ,Screw Tap Extractors and Clamps.

Measuring Tools : Linear and Angular measuring tools – Rules, Calipers, Height Gauges, Depth Gauges, Micrometers, Proptractors and combination set.

Checking Tools : Limit gauges (Plug, Snap and Ring Gauges), dial, radious, pitch, filler and angle gauges. Straight Edge, Try Square, Sine Bar and Sine table.

Making Tools : Surface and Angle plates, V-blocks, scrifbers, Dividers, Trammel, Punches, Parallel Blocks and Dividing Head, Laying out and marking procedures.

Hand Cutting Tools : Cutting Tool Geometry, Chisels, Hacksaws, Files, Taps, Dies, Scrapers Tinners and Ships. Chiping, Sawing Filing and Threading operations.

Lab Session (Code : DT 106)   **12 Hrs/wk**
The practical shall consist of uage of above tools and operations.
Fitting – making all sides perpendicular to each other, external and internal, step, inclined and
reduced surfaces, assembly of two parts.
Sheet Metal Working : Various elementary operations, enclosure fabrication.

Drawing-I (Mechanical) : (Code - DL 1P1)
Lab Sessions   **8 hrs/wk**

Introduction : Drawing as the Language of the Engineer. Its purpose, function and place in the production.

Drawing Equipments :   Use and care of Drawing Board, Minidrafter, Pencils, Inking Pens, T-squares, Set Squares, Protractor, Scales, Stencils, French Curves, compass and Divider.

Lettering: Forms and sizes of letters and numbers, proportions for titles, Single Stroke, Double Stroke, Inclined and Upright lettering.

Orthographic Projections: First and Third angle projection of : --
Lines : Parallel of both axes, Parallel to one and inclined to other axis, Inclined to both axes and applications thereof. Sections of solids and Dimensioning .
Exercises :
The drawing practice shall consist of drawing five sheets on the above topics.Lettering, Projection of Lines, Projection of Planes, Projection of Solids & Dimensioning Sections of Solids.

Mathematics – II (Code : DT 201)
Theory 3 hrs/wk

Number Systems : Binary, octal and hexadecimal system and their inter conversion , fundamental operation with different bases, significant figure, decimal place.

Algebra : Permutation and combination, transformation of a vector.

Differential Calculus : Function, limit of a function, derivative of a function, calculation of derivatives of different functions, maxima and minima, application of derivatives in mechanics uniform motion, velocity and acceleration, projectiles.

Integral Calculus : Concept of integration, limits, indefinite and definite integration of a function, integration of standard functions, applications.

Physics – II (Code : DT 202)

Theory 3 hrs/wk
UNIT 1 : Electromagnetic radiation and Wave Optics : Light and spectrum of electromagnetic radiation & uses, electromagnetic radiation and the earths atmosphere, Wave theory of light, Huygen principles and construction of plane and spherical wave fronts, reflection and refraction at plane surfaces, Interference of light, conditions for steady interference pattern, young's experiment, direction due to a slit, grating, Applications related to these phenomena.
UNIT 2 : Ray Optics and Optical Instruments : Sources of light, luminosity and photometry, velocity of light, reflection, laws of refraction, total internal reflection and optical fibers, refraction, power of lens, lens combinations, dispersion, spectroscopes, types of spectra, colour of the sky, Camera, microscope, telescope, resolving power.
UNIT 3 : Electrons and Photons : Introduction, discharge through gases at low pressures, cathode rays, e/m of electrons, Millikan's experiment, free electrons in metals, photo electric effect, the photons and its quantum interpretation, photo-cell.
UNIT 4 : Atoms nuclei and molecules : Rutherford model of the atom, Bohr model energy quantization, hydrogen spectrum, atomic masses, size of the nucleus, Radio activity, nuclear energy, fission and fussion reaction, nuclear reactor, Molecules, bonding in molecules, rotational and vibrational spectrum.
UNIT 5 : Solid and Semi conductor devices : Solids, crystal structure, energy bands in solids, metals insulators and semiconductors, intrinsic and extrinsic semiconductors, holes and electrical resistivity.
UNIT 6 : Sound : Wave motion, equation of simple harmonic progressive wave, longitudinal and transverse waves, reflection of sound waves, change of phase, superposition of sound waves, transverse vibration of strings, stationary waves in strings and air columns, forced vibrations, resonance, sonometer, resonance tube, melde's Expt.

Reference Books:

1. Engineering Physics by R. K. Gaur and S. L. Gupta.
2. Physics Foundations and Frontiers by G. Gamov.
3. A Text book of Science for technicians : TTTI, Madras
4. A Text book of Physics by Gambhir and Kulkarni.

Electronic Drawing (Code : DT 203)

Theory   **3 hrs/wk**

Introduction : Review of Engineering Drawing.

Draftsman Practices :
Types, classification of Drawing, Drafting Tools, Lettering Techniques, Technical sketching, Dimensioning, Use of templates. 02

Graphic Symbols :
Symbols composition, graphic standards, details of symbol drawing, waveform symbols. Reference designators for consumer, military and complex equipment/components. 02

Components in Electronics :
Drawing of capacitors, resistors, color code, connection devidces, indicating devices, inductors, relays, semiconductor devices switches, transformers.

Block Diagrams :
Symbols block, lettering, lines, typical block layout, practices. 02

Logic Diagrams :
Logic symbols, gates, drawings, involving ICs, combining of gates. 02

Know-how Diagrams :
Circuit schematic diagrams using almost all types of components used in electronic circuits and systems, PCB fabrication drawings, PCB assembly drawings, types of wires, wiring techniques, wire harness diagrams and wiring diagrams. 04

Graphic Drawings :
Charts, graph layouts, rectilinear layout, logarithmic graph layout, characteristic curves polar graphs, homographs. 02.

Reference Books :

1. Electronic Drafting and Design Nicholas M. Raskhodoff.

2. Electronic Drafting & PCB Design – J. M. Kirkpatrick.

Power Electronics- I (Code –DT-204)

Theory-   **2 Hrs/Week**

Power Devices : Power Diode ,Characteristic .Power Transistor ,Characteristics ,Power Darlingtion .Power Mosfets , construction and characteristics .Thyristor ,2 transistor analogy ,V-I Characteristics ,Dynamic characteristics, Methods Of triggering .R,RC,UJT triggering. Various methods of turn off. Methods of protection triac.

SCR Converters : Single phase SCR semiconverter wit R,R-L and DC motor load. single phase SCR fullconvertor with R,R-L and DC motor load.

AC Controllers : Principle of operation .Buck chopper.SCR Jones chopper .Chopper based 1& 2 Quadrant servo drive.

Inverters : Single phase Push- Pull ,Half bridge & Full bridge inverter.

DC Power Supplies : Zener regulated & series transistor regulated dc power supply .UPS: Block Diagrams of on line and off line UPS.

Lab Session : Code – DL 204)   **3 hrs/wk**

1) Volt – Ampere characteristics of Power Diode .

2) Volt – Ampere characteristics of Power Transistor.

3) IB & Lc characteristics of Power Transistor.

4) **Characteristics of mosfet.**

5) **Transfer characteristics of Mosfet (Transconductance)**

6) R & RC triggering of thyristor

7) UJT Triggering of Thyristor .

8) R &RC triggering of traic.

9) UTJ Triggering of T\tac

10) Study of Bock Chopper.

11) Study of Zener regulated Power supply.

12) Study of Transistor regulated power supply.

13) Study of single phase SCR semi converter with R load.

14) Study of single phase SCR full converter with R load.

15) Study of single phase SCR full converter with R-L load.

16) Study of Push-Pull inverter.

17) Study of half bridge inverter.

18) Study of Track based AC phase controller.

Reference books-

1. Power Electronics   M. Rashid
2. Power Electronics   R. Ramshaw
3. Thyristor DC Drives   Dr. P.C. Sen
4. Fundamentals and Applications of Power Electronics   S.T. Valunjkar.

Work shop Tech-II (DT-205)
Theory   2 hrs/wk

Manufacturing Process : Study of equipment ,process, tools accessories and application of Conventional and Non-Conventional matching processes: Sawing ,Turning ,Drilling, Milling ,Shaping, Broaching and Grinding.Heat Generation –cause and remedies, Cutting Fluid selection.

Joining Processes: Welding, Brazing, Soldering and Adhesive Bonding Processes, Various types of fastening methods.

Sheet Metal Working : Shearing, Punching, Blanking, Bending, and Drawing Processes, spring back its causes and remedies, Blank layout preparation.

Powder Metallurgy : Heat Treatment : Annealing, Normalizing , Carburising , Hardening, Tempering and Black anodising processes and Necessities thereof.

Plastic Materials and Processes: Type of plastic materials their properties and uses, Injection,Compression,Extrusion,Blow and Sandwich molding and thermoforming processes. Processes , Various Plastic joining techniques.

Lab sessions (Code: DL 205)   8 hrs/wk

The practical shall consist of 5 jobs based on above topics.

Drilling – Plain drilling ,C' sinking ,C' boring and tapping.

Turning – Plain , Step and taper turning, Thread cutting .

Joining – Welding Rivetting and Screwing.

Finishing – Polishing , Buffing , Sandering and Painting.

Maintenance- Preventive and Breakdown Maintenance.

Analog and Digital Electronics - I (DT 206)
Theory   3hrs/Wk

Diode Theory: Semiconductor theor, conduction in crystal,metals,semiconductors, insulators, doping, unbiased diode static and dynamic resistance of di de, diode approximation.

Bipolar Junction Transistor: Some basic ideas ,forward and reverse bias, CE connection , transistor characteristics ,DC load lines , Transistor configurations and comparison , the transistor switch, the transistor current source ,h parameters, measurement of h parameters from characteristics, transistor data sheets and testing.

Special Purpose Diodes: Zenner diode , zenner regulator LED, photo diode, schottky diode, tunnel diode

Transistor Biasing Circuits: Selection of operating point, bias stabilisation, base bias, emitter feedback bias, collector feedback bias, divider bias, emitter bias, PNP transistor biasing circuits

CE and CC Amplifiers : Bypass and coupling capacitors super position therm for amplifiers, AC resistance of emitter diode, AC beta, the grounded emitter amplifier, AC model of CE stages, CC amplifier, AC model of emitter follower, darlington amplifier.

JFET :Construction & operation of JFET, biasing,characteristics, Parameters, applications of JFET, MOSFET biasing and applications of depletion and enhancement types of MOSFET.

Diode Circuits : Half wave and fullwave rectifiers, bridge rectifier, capacitor and inductor filters, LC filters, Voltage multiplier , clippers and clampers, peak to peak detector, dc return.

Lab Session (Code: DL- 206)   3 Hrs/Week

Characterstics of p-n junction diode, Halfwave and full wave rectifiers with capacitor filterand applications like Clipper circuits, clamper circuits, peak to peak detector and voltage doubler, Characteristic of Zenner diode, Zenner voltage regulator.

Transistor characteristics in common enitter configuration, Frequency response of R-C coupled amplifier, FET Characteristics.

Reference Books:
1. Electronics principles : A. P. Malvino
2. Basic electronics and linear circuits : N. N. Bhargava, C. Kulakshethra , S. C. Gupta.
3. Electronics devices and circuits- Allen Mottershed.
4. Basic Electronics Bernord Grob.

Drawing(Mechanical) – II (Code DL 2P1)

Lab Sessions   **8 hrs/wk**

INSOMETRIC PROJECTIONS :
Isometric scales, drawing of isometric views from given orthographic projections, missing views.

PERSPECTIVE PROJECTIONS : Drawing of perspective views.

DEVELOPEMENTS OF SURFACES :
Drawing the development of surfaces of given solids. Development of sheet metal enclosures .

DRAWING CONVENTIONS :
Various conventions used in the drawing practice as per Is section lines for various materials, springs, Gears, Threads, Knurlings, serrations, Bearings, Broken Sections, Repeated features in drawing.

FASTENING :
Rivets and Rivetted Joints : Various types of standard rivetheads, Single Riveted Lap Joint, Single Rivetted Butt Joint Single Strap / Double Strap, Double Rivitted Lap Joint Zigzag / Chain type, Double Rivetted Butt Joint with Single Strap/ Double Strap Zigzag / Chain type.

Threaded Fasteners and Threaded joints :
Various types of screws, Bolts, Nuts, Studs, Washers, and Various Locking methods.

Welding Conventions and Welded joints :
Various types of welds and their specifications as per IS, Butt Welds, Lap Welds, Spot Welds, Seam Welds , Flug Welds, Fillet Welds.

EXERCISES :

The Drawing Practice shall consist of five sheets on the above topics.

Drawing Conventions and Isometrics Projections,

Perspective Projections, Development of Surfaces,

Threaded Fasterers and Threaded Joints, Rivets and Rivetted Joints, Welds and Welded Joints.

Mathematics –III (Code: DT 301)
Theory 3/hrs/wk

Integral Calculus: Calculation of area, volumes of a body :Multiple Integration, Solids of Revolution.

Statistics : Measure of Central tendencies, mean, median and mode; measures of range, mean deviation, Standard deviation, normal probability, curve and skewness, correlation.

Graphic representation of data : Pie chart, bar chart , Histogram ogive.

Differential equation:

Simple differential equation–Linear, 1st and 2nd order and their solutions.

3D Geometry :

Planes stew lines, angle between line and a plane, angle between two planes , problems. Elementary solid geometry.

Fourier Series : Definitions, odd and even functions; numerical harmonic analysis.

Electrical Technology-II (Code-DT302)
Theory- 2hrs/wk

Transformers: Principle of operation ,emf equations, equivalent circuits ,phasor diagrams. Voltage regulations, losses and efficiency, Various types of Transformers.

DC generators: Principle of operation ,equation of generated emf ,characteristics of various types of DC generations.

DC motors : Principle of operation ,various types of DC motors and their speed-torque characteristics ,and applications. Method of speed control.

AC motors : Principle of single phase induction motor, speed –torque characteristics, and applications. Principal of three phase induction motor ,speed – torque characteristics, and applications. Principle of three phase Synchronous motor ,speed –torque characteristics, and applications . Load angle.

Starters: Starters for DC motor ,3 phase induction motor, Synchronous motor. **Other motors**: Universal motor, stepper motor.

Lab sessions (Code-DL-204) 3hrs /wk
1) Introduction to laboratory general safety procedures, and precautions.
2) Introduction to voltmeter, ammeter and multimeter.
3) Verification of Ohm's law.
4) Verification of KCL nad KVL.
5) Verification of thevenin's theorem.
6) Verification of superposition theorem.
7) Study of R-R series and parallel circuit.
8) Study of R-L series and parallel circuit.
9) Study of R-C series and parallel circuit.
10) Study of R-L-C series and parallel circuit.
11) Study of R-L-C series and parallel resonance.
12) Study of magnetizing characteristics of transformer.
13) Study of voltage regulation of transformer.
14) Study of separately excited DC motor.
15) Study of DC shunt motor.
16) Study of single phase induction motor.
17) Study of Universal motot.
18) Study of DC generator.

Reference books-
1. Electrical Technology-H. Cotton
2. Electrical Technology-B.L.Theraja

Workshop Technology –III (DT 303)

Theory   **2 hrs/ wk**

Finishing Processes : Surface preparation Necessity and processes thereof, Equipments, processes and application of Metallic, Organic, Plastic and Inorganic coating electroplating, anodising,Hot Dipping, Metallising, Plastic Creamic Coatings,Spraypainting power Coating.

Limits, Fits and Tolerances: Introduction, concept of interchangeability and selective assly, types of fits and their selection. Methods of tolerance specification and tolerance stacks. IS 919:1962 and ISO 9000/IS:14000 and ISO 9001/IS : 14001. Surface finish its measurements and IS specifications. Inspection and quality control.

Jigs and Fixtures : Necessity, Principles of Resting, Location and Clamping, Elements of Jigs and fixtures . Design of Simple jigs and fixtures.

Machine Maintenance : Necessity , types of maintenance methods.

Advanced Manufacturing Techniques : Computer Aided Manufacturing.

Analog and Digital Electronics – II   (DT 304)

Theory   **3hrs/wk**

Power Amplifiers : Need for power amplifier, difference between, voltage and power amplifier, class A, B, and C power amplifiers, transistor power rating, case temperature and heat sinks.

Oscillators : Concept of negative and positive feedback and its effects, Barkhausen criteria, Phase shifts oscillators, weinbridge oscillator , tuned collector oscillator, Hartley oscillator, colpitt oscillator, crystal oscillator, multivibrators

Introduction of Operational Amplifier : Block Diagram of OP-AMP, ideal and practical OP-AMP, Voltage   shunt and   voltage series feedback, measurement of OP-AMP parameters, frequency response of OP-AMP.

Linear Applications of Operational Amplifiers : Inverting and non- inverting amplifier, summing amplifier, current booster for voltage amplifier, voltage controlled, current source, differential and instruction amplifiers, active filters.

Non Linear Applications of Operational Amplifier : Transfer characteristics of operational amplifier, comparators, window comparators, schimitt trigger, integrator, differentiator, square and triangular wave generation.

Regulated Power Supply : Voltage feedback regulations, current   limiting, power supply characteristics, three terminal voltage regulator, DC-DC convertor, switching regulators, IC switching regulators.

Timer and PLL : Block diagram of IC 555. Monostable and astable operation, voltage controlled oscillator, temp generator, PLL and its applications.

Modulation and demodulation : Modulation and demodulation techniques of AM & FM.

Lab Session (Code : DL 304)

Wein bridge Oscillator, Class B Push pull amplifiers, measurement of operational amplifier parameters,Inverting and non inverting amplifiers.
Second order Butterworth low pass filter,study of comparators, precision rectifier, astable multi vibrator using IC 555, study of 3 terminal voltage regulators, study of diode detector.

Reference Books:
1. Electronic Principles by A. P. Malvino.
2. Basic Electronics and Linear Integrated circuits by N. N. Bhargava, D. C.. Kulakshthra & S.C. Gupta   .
3. Operational Amplifiers and Linear Integrated circuits by Ramakanth A. Gaiakwad.

PCB Technology –I (Code DT- 305)
Theory 2 hrs/wk

Introduction to printed circuit board design: History & Defination of printed circuit board design ,Classification of PCBS– SSB, DSB (PTH & Non PTH) , Multilayer PCB. Application are Various PCBs, Useful standards on PCBs

Overview of the PCB design: Introduction to Semiconductor Packing Technology, Role of scale & Grid in PCB design, PCB mounting method and PCB standards, Layout considerations- Land Requirement, Layout Methodology,Design Elements & Performance Parameters, Manufacturing Documentation like role of Block Diagram,Schematic drawing Netlist generation Assembly Drawing, Mechanical Drawing.

Layout Planning and Design : Electrical Design Consider – Resistance in general, Capacitance in general, Inductance of Conductor and Conductor Pattern,Component placement approach with respect to conductor with, conductor shapes,Thermal Consideration, Mounting consideration, requirement of heat sink, Layout check with respect to mechanical and electrical consideration,Layout Methodology,Layout Design Checklist and inspection, Useful standards.

Design rule for Analog circuit PCBS: Design rule for High frequency amplifiers/ oscillator, Design rule for Multistage amplifiers with high power o/p stage,Design rule for feed-back amplifier,Design rule for differential amplifier,Supply and ground line conductors considerations.

Art Work Generation: Artwork approach and design guidelines for SSB & DSB design, Artwork Preparation methods-Taping UP: Laying down the tapes and drafting , material using appropriate methods,Design Guidelines for Artwork Preparation – Conductor Orientation, Conductor ,Routing, Spacing Importance of hole diameter and solder Paid diameter ,Advance methods of Artwork generation,Artwork Inspection and checks.

Film Master Generation: Introduction ,Parameters of Photographic film like film emulsions, dimensional, Stability of film master, types of film, Types of Reprographic Cameras, Dark-Room setup and procedure of film processing, Film Registration, Faults related to film processing and remedies.

Properties of Copper Clad Laminates: Anatomy of Laminates, Types of Laminates with application,Manufacturing Process of copper Clad,Physical and Electrical properties of Laminates, Evaluation of Laminates and test methods like peel strength, flexural strength.

Surface Preparation: Need of Surface Preparation, Manual Cleaning Process, Mechanical Cleaning Process,Trends in cleaning process,Test for Cleanliness.

Screen Printing in PCB Fabrication : Introduction, Material required for screen printing – screen Frames, Screen fabrics Squeegees, Printing Inks and curing methods, Direct and Indirect Methods of Pattern transfer, Manual Screen printing and Automatic Screen Printing process, Trouble – Shooting.

Photoprinting: Photo resist in general, Characteristic of photo resist, Types of Photoresist and coating/Iamination methods, Manufacturing process of SSB and DSB using wait film process, Dry film Resist – Features & catagaries. Processing of Dry – Film Resisst, Trouble shooting.

Component Assembly Techniques: Classification of component assembly Techniques, Formation and mounting Techniques,PCB cleaning methods, PCB Protection methods, Repair and rework.

Soldering Techniques: Introduction, Theory of Soldering, Types of solder alloys and fluxes, Solder Paste for SMDS, Tools. Soldering Techniques – Manual soldering, Mass soldering, Role of solder mask, Solder mask application methods, Quality Control of solder Joints, Solder Joint Defect & cause, Re-Work and Reaping of PCBs.

Lab Session (Code : DL 305) 6 hrs/wk

Practicals are based on above syllabus .

Reference Books:
1)PCB Technology- Design,Fabrication. Walter C.Booshart
2) Printed Circuits, their Application and Design. Dukes J.N.C.
3) Printed Circuits Handbook. C.F.Coombs

Test And Measurement – I   (Code : DT 306)

Theory   3 hrs/ wk

Measurement and Instruments : Introduction and importance of measurement, methods of measurements , types of instruments, classification of instruments, functions of instruments.

Erroers : Types of errors, gross errors , systematic errors and random errors.

Staarisrical Analysic : Arithmetic mean, deviation , average deviation , standard deviation , variance dispersion and range.

Bridge Circuits : D.C. bridges : wheatstone bridge and Kelvin bridge.

A.C. bridges : General A.C. bridge ,capacitance comparison bridge , Inductance comparison bridge, Maxwell bridge , Hay bridge , Schering bridge . wein bridge and their applications such as Q factor and D factor measurement.

Analog Meters : Introduction and basic concepts, DC meter movements : D arsonval and taut – band meter movement.

D.C. Ammeter : Theory, Multirange ammeters (individual shunt method and Ayrton or universal shunt method) , precauitions,05 Accuracy.

D.C. Voltmeter : Their sensitivity of voltmeter and loading effect, Multrange voltmeter (individual multiplier method and potential divider method) , accuracy.

A.C.meter movements: Electrodynamo metermovement , moving iron metermovent , electrostatic

Meter movement and thermocouple meter movement.

Electronics Voltmeter : Introduction , differential amplifier type, source follower type and direct coupled amplifier with FET input type electronic voltmeter

A.C. voltmeter : Using rectifier , true RMS voltmeter electronics multimeter , study of commercial multi meter , selection criteria for analog voltmeter.

Testing of components : Testing of passive components , Testing of active components , common failures of various components system of units.

Lab Session   (Code DL 306)   3 hrs/wk

1. Study and selection of general test and measuring instruments and how to use them.
2. Study of precision, accuracy, sensitivity of various available measuring instruments and comparison .
3. Errors in insruments and need of statistical analysis.
4. Study of principles of wheatstone bridge and Kelvin double bridge and measurements of resistance with these bridges.
5. Application of wheatestone bridge like temperature measurement and light intensity messurement.
6. Study of principle of operation and performance characteristics of basic meter movement.
7. Conversion of basic meter movement(D.C.)into D.C.voltmeter & its performance   evaluation.
8. Conversion of basic meter movement (D.C.) into D.C. ammeter and its performance evaluation.
9. Locating test points in a given circuit
10. Teasting of active and passive components with the help of analog and digital multimeter.
11. Conversion of basic D.C. meter movement into A.C. Voltmeter.
12. Study of available analog multimeters and selection criteria.
13. Component sorting using different equipments.
14. Measurment of various parameters of diodes and transistors.

Reference Books:

1. Electronic instrumentation & Measurement Techniques : W.D. Cooper & A.D. Helfrick
2. Electrical & Electronics Measurement & Instrumentation   : A. K. Sawhney.

Computer And Data Processing –I   (Code : DT 307)

Theory   **3 hrs/wk**

Programming with C

Introduction to Problem solving :   Algorithm, flow charts , Tracing flow chats ,problem solving methods, Need for computer Languages, sample program written in C.

C Language Preliminaries : C character set Identifiers and keywords, data types , declarations, Expressions, statements and symbolic constants.

Input – Output : Getchar, putchar , scanf, printf, gets, puts, functions.

Pre- processor commands : #include, #define, #ifdef

Preparing and running a complete C program.

Operators and expressions: Arithmetic , unary, logical, bit- wise, assignments and conditional operators.

Control Statements : While, do -while , for statements , nested loops, if else, switch , break , Continue, and goto statements, comma operators.

Storage types : Automatic , external, register and static variables.

Functions :   Defining and accessing, passing arguments, Function prototypes , Recursion, Library functions, Static functions.

Arrays : Defining and processing, Passing arrays to a function, Multi dimensional arrays.

Strings : Defining and operations on strings.

Pointers :   Declarations, Passing pointers to a function, Operations on pointers, Pointer Arithmetic , Pointers and arrays, Arrays of Pointers, function pointers.

Structures : Defining and processing, passing to a function, Unions, typedef, array of structure, and pointer to structure.

File structures : Definitions, concept of Record, File operations: Storing, Creating ,retrieving, Updating Sequential, Relative, Indexed and random access mode, performance of Sequential Files, Direct mapping techniques. Absolute, relative and indexed sequential files (ISAM) concept of index, levels of index, overflow of handling.

File Handling: File operation, Creation, copy, delete, update, text file, binary file.

Lab Session (Code : DL 307)   **6 hrs/wk**

Practicals are based on above syllabus .

Analog and Digital Electronics – III (DT 401)

Theory   3 hrs/ wk

Number System : Binary numbers, binary to decimal and decimal to binary conversion, binary addition , subtraction , multiplication, division, hexadecimal numbers, hex to decimal and decimal to hex conversion, 9'S and 10'S compliment.

Binary Code: BCD numbers, 8421 BCD code, BCD addition , excess -3 code , excess 3 , arithmetic , Gray code, 5 bit codes, alphanumeric codes ,EBCDIC code ,error detection codes, even and odd parity.

Logic Gates And Boolean Algebra : Different logic gates, positive and negative logic, demorgan's theorems, universal gates , laws and theorems of Bollean algebra.

Simplifying Logic Gates: Fundamental products , sum of products, AND – OR networks, algebraic simplification, simplification using K-map, NAND –NAND networks, products of sum solutions.

IC Logic Families And Characteristics : Evolution of IC logic families, basic TTL NAND gate, characteristics of standard TTL Logic family, comparison of different TTL logic series, wired logic, open collector devices, tri-state devices, CMOS logic family and its characteristics, TTL –CMOS interfacing.

Arithmetic Circuits : EX-OR, EX-NOR circuits, half adder, full adder, parallel binary adder, half and full subtracters , IC adders.

Combinational Logic : Decimal decoder , BCD to seven segmenet decoder, parity generator , multiplexers , decoders, comparators.

Sequential Circuits : Flip – Flops –S-R, J-K, T, D types, Master Slave, J-K flip – flop, binary ripple counters, Up-Down counters, propagation delay in asynchronous counters, synchronous counters, IC counters, shift registers- serial in serial out , serial in parallel out. IC shift registers, shift register counters.

Pulse Modulation : Introduction , Types , pulse width modulation, pulse code modulation, pulse position modulation.

LAB SEESION   (Code: DL 401)   6 hrs/ wk
1. Study of logic gates.
2. Universal gates,
3. Nexter circuits.
4. Study of 4 bit parallel adder.
5. Application of multiplexer IC 74153 as a full adder and full subtractor .
6. Study of binary counter IC 7493.
7. Application of decoder IC 74138.
8. Study of BCD to Seven segment decoder / driver IC 7447 .
9. Study of parity checker.
10. Study of magnitude comparator.
11. TTL- CMOS interfacing.

Reference Books:
1. Digital Principles and Applications - A.P.Malvino & D.P.Leach.
2. Digital Electronics - Gothman.
3. Principles and Applications of Digital Electronics - Larry D. Johnes.
4. TTL Integrated Circuits - Texas Instruments.

PCB Technology – II   (Code : DT 402)

Theory   **2 Hrs/wk**

Design Consideration for digital circuits: Design rules for TTL, CMOS ECL circuits, Reflection and Crosstalk, Ground to supply noise, E.M. Interference, Problems in design & Recommendations and summary .

Design Consideration for Power Electronics Circuits: Introduction , Dividing Circuit into High and Low Power Part, Copper Clad Laminates, PCB Terminal Connections & their Assembly, Conductor Width & Thermal Consideration

Automation in PCB Design : Limitation of Manual Designing, Introduction to various EDA tools, CAD operation, Schematic Capture, Layout, Automation in component Placements, Routing Assignments and routing Procedures, Post process and Gerber datageneration, Design rules check, Generation of film master using photoplotter, data transfer mechanisms.

Plating Process : Introduction , Need for Plating , Types of Plating, Platting Techniques : Immersion Plating for Tin and Gold, Electroless Copper plating & Electroplating in detail, Special Platting Techniques , Alternative Finishes ,Plating Defects & Plating Quality Control, Consideration for shop floor, Useful for Standers

Etching Techniques: Introduction, Etching Solution and Chemistry, Equipments for etching,Problems in Etching, Facilities for Etching Area, Problems in Etching Electrochemical Etching, Mechanical Etching

Mechanical Operation : Need for Mechanical Operations,Cutting Methods – Shearing, Sawing, Blanking, Milling & Routing, Hole Punching , Drilling – Classification of drill bits, Drill details, Drilling M/Cs, Drilling Problems, Micro vias, Use of UV laser for Drilling PCB, Hybrid Laser Drilling Process, Useful Standards

Multi- layer Boards : Introduction,Introduction Techniques – PTH, Buried and blind via, Materials for Multi – Layer boards ,Mechanical & Electrical Design Consideration of Multi- Layer Boards,Fabrication Process for Multi – Layer Board, Useful Standards

Flexible Printed Circuits Boards : Introduction ,Construction of Flexible PCBs – Types of films, foils & Adhesives,Design considerations in Flexible Circuits, Manufacture of Flexible Circuits, Rigid Flex Printed Circuits Boards,Terminations, Advantages of Flexible Circuits ,Special Applications of Flexible Circuits, Useful Standards

PCB Technology Trends: Fine Line Conductor with Ultra – Thin Copper Foil,Multi Wire Board , Metal Core PCBs,Additive and Semi additive Process, Mechanical Milling of PCBs.

Design with Surface Mounting Technology: Stencil Printing of SMDs, Industrial SMT Assembly Process,SMD Soldering – Manual and Reflow Soldering Techniques,Repair and Rework of SMDs , Advantages and Limitations of SMT

Quality, Reliability and Acceptability Aspects: Quality Assurance in PCB, Testing for Quality Control Methods ,Testing for Printed Circuits Boards,Reliability Testing, Acceptability of PCBs, Useful Standards

Environmental Concerns in PCB Industry: Pollution Control in PCB Industry, Polluting Agents, Recycling of water ,Recovery Techniques, Air pollution , Recycling of Printed Circuit Board,Environmental Standards ,Safely Precaution for the Personal,Toxic Chemicals in PCB Fabrication, Lead – free Soldering,Useful Standards.

Lab Session (Code : DL 402)   **6 hrs/wk**

Practicals are based on above syllabus .

Reference Books:

1)PCB Technology- Design,Fabrication. Walter C.Booshart
2) Printed Circuits, their Application and Design. Dukes J.N.C.
3) Printed Circuits Handbook. C.F.Coomb

Test and Measurement - II : (Code DT 403)

Theory   **3 hrs/wk**

Cathode Ray Oscilloscope : Introduction, Block diagram, CRT constructional and operational details, deflection systems, Multiple trace oscilloscope, magnifiers and delayed sweep, study of common control panel controls, applications, Introduction to storage oscilloscope.

Waveform Generation: Introduction to oscillators, Requirements for oscillations, Audio oscilloscope (Wein bridge oscillator and phase shift oscillator), Radio Frequency oscillator (Hartley and colpitt oscillators) Square wave, triangular wave and pulse generators, function Generator.

Digital Measurements Technique : Basic of counters, Time base circuitry, totalizing mode, frequency measurements, frequency ratio, measurement, period measurement, time Interval ,measurement, Pulse width measurement scaling,Accuracy, comparison between analog and Digital meters Digital to Analog convertors, Analog to digital convertors, paralleltype, counter type, servo counting type, successive approximation type, single slope integrating type and dual slope integrating type ADC, Range Resolution, Sensitivity, Accuracy and error.

Digital Multimeter Circuits : D.C. Voltage attenuation, current to voltage convertor , AC/DC convertor, Resistance to voltage convertor, Accuracy of digital voltmeter.

Lab Equipment : Digital IC Tester, Digital RLC meter, Logic analyzer, function generators, Introduction to records. Testing of Digital (TTL & CMOS) IC parameters.

Lab Session (Code : DL 403)   **3 hrs/wk**

1. Study of CRO control panel, and their applications Amplitude and Time measurements with CRO
2. Phase shift measurements, component measurement, and R –C time constant measurement with CRO.
3. Study of wien bridge osoillator and square wave generator .
4. Study of triangular wave generator and pulse generator .
5. Study and testing of available function generator.
6. Study and testing of DAC and ADC.
7. Study of 3 and 1/2 digit voltmeter using IC 7107 and its performance evaluation.
8. Study of Digital frequency counters and Digital techniques for time measurement, pulse width measuriques , wire harness diagrams and wiring diagram (04).

Reference books:

1. Digital Instrumentation   - A. J. Bouwens

2 Electronic Instrumentation & Measurement Techniques - W.D. Cooper & A.D.Helfrick

3.Electronic Devices & circuits - Mottershead

4.Electronics Instrumentation & Systems – R.G. Gupta.

Components and Hardware (Code: DT 404)

Theory   **3 hrs/wk**

Introduction To Reliability & Speccifications: Reliability, specifications of electronic components, Stability, Drift, Catastrophic failure , MTBF MTTF.

Resistance: Resistance standardization, standard voltage, and wattages for resistances, table and preferred values, classes of resistors colour codes. Power rating, voltage rating tolerance, Temperature coefficient, stability, drift power rating, frequency performance of resistances. General constructions of variable resistances, Fixed resistances and non inductive resistances. Specifications, properties and constructional details of fixed resistors, carbon film, carbon composition , metal film and wire wound resistance, resistance wire, power resistors, thick film resistors and thin film resistors. Specification, properties and constructional details of variable resistors wire wound, carbon film and cermet potentio meters. Specifications, properties and applications of thermistors, LDRS, VDRS. Specification,Properties and applications of fuses.

Capactiors: Capacitor Standardisation : Standard voltages for the capacitors: Tables of preferred values; capacitor colour codes. Capacitor characteristics – capacitance, Dissipation Factor, Equivalent series Resistance, Equivalent parallel resistance. Polarization and its affects, Insulation Resistance, Leakage Current and Dielectric strength, voltage Reactive power and ripple current and dielectric strength

voltage Reactive power and ripple current ratings. Capacitor Tolerance Temperature coefficient, draft, Stability and frequency performance of capacitance, general construction of non polarized and Electrolytic capacitor variable capacitors . Types of Capacitors- ceramic, mica polystyrene, polypropylene, metallised polypropylene metalised polycarbonate, glass, aluminum , electrolytic, tantalum ; their properties, constructional details and applications .

Inductive Components: Inductor Characteristics – Inductance Inductor Q, Inductor Energy, Inductor construction, Inductance factors of gapped and un- gapped cores, variable inductors , types of inductors their features and specifications linear , filter inductors both line and high frequency Charging Inductors, circuit inductor and RF coils, Definition of Saturable Inductors.

Transformers: Review of Basic of transformer, Transformatio, Transformer equivalent circuit. Transformer coupling, Coupling coefficient, Leakage Inductance, Core and Copper loss, Types of transformers, Features and specifications of wide band transformers Pulses transformers, RF and AF transformers.

Cells & Batteris : Concept of ideal voltage and current sources, constant voltage and constant current source –Types of batteries – zinc-carbon, zinc chloride, alkaline, mercury; silver oxide, lithium oxy halide and lithium solid state batteries, Their capacity, discharge rates , temperature performance, relatailve costs and applications. Secondary Batteries – Nickel – cadmium zinc Alkaline and lead Acid

batteries, Their capacity, discharge rates, temperature performance, recommended charging cycle and relative costs and applications; maintenance requirements for various batteries, choice of batteries for different application.

Relays & Switches : Relay characteristics – Contact Rating , Hold Non – Up

Dropout ,operate time , release time transfer time, Classifications of relays on the basis of input, output, duty rating and performance. Relay performance during pick up and dropout. Contact types, ratings and effects of load conditions on contacts, types of relays – General purpose , power type, Telephone type, Dry need contact type and high voltage relays, Their specifications and applications. **Solenoids**: Constructions, specification and applications.

Switches : Manually operated switches – Limits/hazards of manual operation of switches, types of manually operated switches push button, push pull, slide switches, lever switches, turn button switches and micro switches, their features and applications. Manually operated selector switches – Thumb wheel, lever wheel, Rocker types, Rotary selector switches, matrix type selector switches and key- boards; their principle of operation and applications. Sensing switches type

and applications of Electrically operated switches stepping switches, contractions and circuit breakers.

Connectors and Connecting Devices : Level of connections. Generic types and specifications of connecting devices for connection levels 2, 3 and 4 Rating and specification of connectors, Types of connectors, Printed Writing connectors, coaxil connectors, Flat cable Connectors, Hermetically sealed connectors and plate connectors. Factors affecting choice of connectors, Euro standards. CODIN PACKAGE. Choice of connectors for different applications and their laoding pattern.

Enclosure: Standard enclosures, specifications, Racks, subracks - their Standards and finishes, panel mounting components, Fuse and Fuse holders, displays and Heat sinks – their standards and mounting patterns.

Consumer Electronics (Code: DT 405)

Theory   **3 hrs/wk**

1 .B/W TV System ,scanning,composite video signal,colour fundamentals,chromaticity diagram. Video signal for colour,luminance signal,colour difference signals, chrominance signal.

2.TV cameras and picture tubes.-CCD image scanner,colour TV,camera and picture tubes,Display device,LCD,TFT etc.

3.Monochrome TV receiver;- RF tunner,IF Subsystem,video amplifier,sound section,Horizonal and Vertical deflection circuits,Basic block diagram of Monochrome TV receiver.

4Colour TV Reciever:- Difference between monochrome and colour TV,Block diagram of colour TV receiver(CRT Type)

5Advanced TV :-HDTV,Super high vision TV-TV of the future.Digital TV,LCD TV,LED TV,

6 CD recording,CD,DVD,JPEG,MPEG-2,MPEG-4,PA SYSTEM,Cordless Micophone.

Lab Session (Code : DL 405)   **6 hrs/wk**

Practicals based on the above syllabus

Text Books-1)Modern television practice- R.R. Gulati

2)Basic TV by Grob   3) Digital TV by Ibrahim

Computer and Data Processing –II (Code : DT 406)

Theory   **3 hrs/wk**

Applications of Computers (6 hours) : In Business, data processing , communication, medicine, agriculture , process industries ,civil, marine, production , education, space research etc.

Application software packages (21 hours): study of a range of available application software packages. At least three packages to be introduced wrt hardware requirement, use, use cost etc. Need of database management system, study and applications of at least three software packages and its basic commands covering varieties like one text processing package, one data base package and one CAD package.

Multiuser Systems : Introduction to multi user computer systems (Hardware & Software concepts) , Networking of computers .

Instrumentation utility: Interface options available for PC based instrumentation.

Lab Session (Code : DL-406)   **6 hrs/wk**

Impact of Introduction of computers: a case study based on study of any one situation in which computers had its impact as far increasing the efficiency, speed, service quality is concerned.

With the specified user requirements, selection of application package (s) for the user along with hardware configuration .Use of wordstar and CAD package. Writing simple command files in base for a particular application.

SEMESTER–V

Test and Measurement –III (Code : DT 501)

Theory   3 hrs/wk

Introduction : Differences between sensors and transducers. Role of transducers in measurement system, classification of transducers, static and dynamic characteristics.

Transducers : Construction and principles of transducers capacitive, pizo-electric electromagnetic, electrochemical, photoelectric, semiconductor resistive, thermoelectric and hall effect transducers. **Measurement Methods:** Measurement of position, direction distance, acceleration , velocity, revolution, force, torque, light and associated radiations, temperature, sound, liquid, flow, moisture, PH, radioactivity, strain and pressure, Introduction to data acquisition system.

Lab Session (Code : DL 501)

Signal conditioning of photo transistor, Application of IC temperature sensor, Signal conditioning of resistive transducer, Study of PH sensor, Study of thermo couple signal conditioning system, Study of signal conditioning of LVDT.

Reference Books.

1. Sensors And Transducers A guide for technicians – P.R. Sinclair.
2. Instrumentation Measurement And Analysis – N.C. Nakara, K.K .Choudhary.
3. Measurement Systems- Application and Design – ERNEST O. Deoblin.
4. Instrumentation – Devices and systems – C.S. Rangan, G.R. Sharma, V.S. Mani.

Power Electronics II (Code – DT – 502)

Theory-   3 hrs/wk

Power Devices: Thyristor, Two transistor analogy ,V-I Characteristic,Dynamic Characteristics, **Methods of triggering:** R, RC, UJT triggering, Various methods of turn off. Methods of protection, Triac , IGBT, GTO: Construction and characteristics.

SCR Converters: Single phase SCR semi converter with R, R-L and DC motor load. Single phase SCR full converter with R,R-L and DC motor load. Three phase SCR Semi converter with R & R-L load. Three phase SCR full converter with R & R-L Load. SCR dual converters. Four Quadrant operation.

Closed loop DC Drives: Synchronization, feed backs and regulation. Regenerative, Braking in DC drives. **AC Controllers:** Stabilizer using relays,Triac based AC phase controller, integral cycle control. **DC Choppers:** Buck-Boost chopper, SCR Voltage commutated chopper. Equivalent Circuits and waveforms, SCR Jones chopper. Chopper based four Quadrant servo drive. **Inverters:** 3 phase half bridge and full bridge inverter. Single phase SCR current Source inverter .Variable DC Link inverter.SCR series resonant inverter. McMurray Inverter, Murray-Bedford inverter. **Cyclo converters:** Single phase SCR cyclo converter. Principle, Waveforms. **SMPS:** Principle of operation, Circuit diagram. Merits and de-merits. UPS-Power circuits of On line and off line UPS. Principle of operation .

Lab Session: (Code-DL502)   6hrs/wk

R & RC triggering of thyristor. UJT triggering of thyristor. R & RC triggering of triac.UJT triggering of triac, SCR parallel capacitor turn off ,SCR resonant cathode pulse turn off, SCR series capacitor turn off ,Study of series operation of power devices ,Study of parallel operation of power devices, Study of Triac based AC phase controller, Study of single phase SCR semiconverter R load , Study of single phase SCR fullconverter R-L load,Study of Buck-Boost chopper,Study of voltage commutated chopper ,Study of SCR resonant inverter, Study of single phase cycloconverter.

Reference books-

(1). Power Electronics : M. Rashid (2). Power Electronics: R. Ramshaw
(3). Thyristor DC Drives : Dr. P.C. Sen
(4). Fundamentals and Application of Power Electronics : S. T. Valunjkar

Microprocessors (Code: DT 503)

Theory   3hrs/wk

Historical Background of Microprocessors: Brief history and origin of Microprocessors, early developments, early processing chips and their originators.

Basic Concepts: Tri-state logic concepts, bus concepts, sharing of common bus by multiple elements/devices.

Study of 8085 microprocessor architecture and internal parts: Overall concep regarding functioning of microprocessors. Study of various constituents of microprocessor architecture like ALU, Control and Decoding units , program counter, Stack and stack pointer, general and special purpose registers.

Programming of Microprocessors: Steps involved in execution of instruction various phases of instruction cycles like Fetch, decode and executes cyclesalog with diagrammatic illustration of data flow during every phase of instruction, programming exercises on 8085 microprocessor.

Interrupts: Concepts of interrupts, uses of interrupt lines, interrupt service routines, methods of handling multiple interrupts etc.

Interfacing :Simple interfacing examples, address decoding concepts, role of control signals, address lines and data lines in inrerfacing, progamable peripheral interface (PPI), interfacing of i/o devices like seven segment display, matrix keyboard, DAC through progamable peripheral interface

Assembly Language Programming:Assembler, Cross Assembler, Assembler Directives, Writing programs using cross assembler, simulation and debugging of programs using 8085 simulator.

Lab session (Code : DL503)   6hrs/wk

Study of microprocessor kit, programming exercises covering data processing, Data transfer, Program control instructions, programming exercises on software & hardware interrupts, serial data transfer, programming exercise on internal resourses of microprocessor kit like use of display, keyboard, i/o parts etc.

Exercises on interfacing of LEDs, keys, seven segment display, matrix keyboard , ADC, DAC, relays etc.

Product Design (Code : DT 504)

Theory   3hrs/wk

Introduction : Product development process and the role of product designer therein

Industrial Design: Design methodology, Ergonomics & Aesthetics of design, design of control panels. Communication techniques , Sketching, Rendening and Drawing.

Physical Design: Design of Assembly and individual parts from Maintenance, Manufacturing, Assembly, Safety, Strength, Heat dissipation, EMI/RFI Shielding considerations. Assembly Detailing

Documentation: Role of Product Documentation in product development process. Preparation of following documents.

Product concept – Sketching, Product Perspective, Product Assembly, Individual Part Drawing Sheet Layout. Control panel layout, wiring Harness Drawing, Any other necessary document.

Lab Session (CODE: DL 504)   3hrs/Wk

The practical   shall consist of a case study based on following exercises.

Sketching, Rendering, Exploded view, Control Panel, Design and Layout, Mount Board Model Making.

Material technology (Code: DT 505)

Theory   **3 hrs/wk**

Introduction : Atomic structure, chemical bonding, ionization potential, electron affinity, electro negativity , band energy .

Crystal Geometry and structure Determination: Crystal symmetry, System and classes structure of solids ironically bonded, covalently bonded, metallically bonded . Bagg's law of X-ray diffraction.

Conductors and Resistor : Materials used for conductors and resistors, properties and characteristics of good conductors. Superconductivity,Properties & applications of Resistors . Materials used for overhead lines, underground cables, electrical machines winding. (04)

Semicoductors: Definition working, applications, types commonly used. Thermistor, LCD, LDR photoconductivity ,photovoltaic materials, Hall effect, piezoelectric Materials. (05).

Insulators: Classification, Properties (electrical, mechanical, thermal, chemical) Ceramic, Mica, glass, rubber plastics. (05).

Special Purpose Materials: Thermocuple, soldering, fuse,contact, refractory, structural, fluorescent and phosphorescent, radioactive materials. (04).

Mechanical Properties and Testing : Stress, Strain, Hookes law, Young modulus. Strength, resillience, plasticity & elasticity, toughness , hardness, brittleness, ductility & malleability, fatigue & creep. Tersile test, compressive test & hardness test. (05).

Ferrous and Nonferrous Materials: Introduction, Classification, Properties, applications of ferrous materials, iron & steel, Nonferrous materials cu, pb, AL, NI, ZN, Tin, (sb), Ag with their alloys. (06).

Phase Diagrams: Introduction, rules, construction, basic terms used. (03).

Other:Magnetic,Thermal and chemical properties, oxidation, mechanism, oxidation mechanism, oxidation resistant materials, Corrosion, principle, Methods of prevention.(09).

Reference Books :   **Authors**

1. Material Science & Process   :   S.K. Hajra Choudhary.

2. Material Science & Engineering   :   V. Raghavan,

3. Introduction to Electrical Engg. Materials :   C.S. Indulkar

4. Electrical Engg. Materials   :   N. Al agapan , N.T. Kumar

5.Materials and Process in Manufacturing: E. Paul Degarmo,J. Temple Black, Bernald Kohser.

Costing and Management (Code : DT 506)

Theory   **2hrs/wk**

Introduction to Estimating, costing and Engineering Economics : Definition of Estimation, costing and differences between them, Qualities of an estimator, Sources of Errors in Estimation, Relation between costing and estimation, avoidedable and unavoidable errors in estimation, various time allowance. Disadvantages of over and estimation, Importance of the subject in relation to Manufacturing process.

Elements of costs : Main elements which are Important for the total cost.

Components of Cost : Components of cost that lead to selling price.

Estimation : Estimation of selling price of PCB's, PCB assembly, Black and White TV assemblies, Power supplies including sheet metal box. Equipment Assemblies etc.

Industrial Management : General principals of management, Principal of management, Role of Administrations, Planning, organization, Direction, control, Decision making, problem solving, communication and motivation, Importance of Data and information, Conflict Resolution and Human relations in the context of management.

Structure of Organization : organizational structure, statutory regulations to start Industry, Business etc.

Personal Management : Overview of various types of actions that constitute personal management, Role in personal management. Identification of major principals, relation to the main elements of personal management. Analysis of the major problems of and evolution of solutions.

Supervision: Concept of Unity of Commands, scalar chains and functional. Responsibility, Analysis of component, Functions of supervision. Identification of ways and means of Insuring effective supervision.

Purchase and Stores Control: Methods of purchases, procedures adopted in store, organization. Minimization on of IV inventory cost.

Reference Books: **Authors**

1. Industrial organization and engineering Economics   : Banga and Sharma .
2. Mechanical estimation and costing   : T.R. Banga and Sharma.
3. Personal Management   : Dale Yoder.
4. Industrial Management   : Koontz and C.O.Donnel.
5. Industrial Management   : Banga and Sharma.
6. Work study   : O.I.L.O. Publication

Microcontroller (Code : DT-601)

Theory   **3 hrs/wk**

Introduction to microcontroller: Comparison of Microprocessor, Microcontroller and Microcomputer, Evaluation of Microcontroller, Terminology- RISC, CISC, Harvard and Von Neumann Architectures Memory types:- EEPROM and FLASH, commercial Microcontroller devices and families.

8051 Microcontroller: MCS-51 Architecture and details, pin configuration, 8051 Hardware details- Clock. Oscillator, Registers, SFRs, DPTR, Flags, Stack, PC, Internal RAM and Rom as Data Memory and Program memory, I/O Parts, Interfacing of External Memory Power saving modes.

MCS-51 Addressing Modes and Instruction Set: 8051 Addressing modes, MCS-51 "instruction ser, Programming Exercises.

Assembly and C Language Programming: Development systems tools, Editor , Compiler, Assemble< Creating carious files run the 8051 program (C, asm, obj, lst and hex files) Assembler Directives, Software Simulators of 8051 in assembly and C languages.

MCS – 51 Timers /Counters, Interrupts and Serial Communication:

Timer modes and programming, Study of SFRs of timer TMOD and TCON in detail interrputs of 8051 and their priority, Study of IE and IP SFRs, Serial port and its Programming in different modes, Study of serial port SRFs ie SBUF, SCON.

Interfacing External Devices: Interfacing Extarnal Program and data memory, Seven segment Displays, LCD module, Matrix keyboard.

Lab session :(Code:DL 601)   **6hrs/wk**

Programming exercises in c and assembly ;language covering program and data memory, i/o port, Peripheral and external interrurpts, power saving modes.

Interfacing of devices like keys, relays, leads , seven segment, LCD Module, Matrix keyboard etc.

Servicing and Maintenance (Code : DT 602)

Theory   **2hrs/wk**

Troubleshooting Electron Tube Circuits : Tube fundamentals & testing, How & Why tube fails, Troubleshooting CRO.

Power Supply : SMPS, UPS Servo Stabilzer etc.

Personal Computers: Introduction to PC Range of computers, various cards ysed in PC, PC ? XT & their block diagram. Various faults in PC & fault fidding.

Peripherals: Peripherals used with PC like keyboard, printer, Monitor, Floppy disk drive & Hard disk drive etc.

Lab Session (CODE : DT 602)   **6 hrs/wk**

Study of various functional blocks, faults and trouble shooting related to CRO, SMPS, Servo stabilizer, UPS, PC/PC XT.

Study of peripherals like keyboard, monitor, printer, Diskdrives

Reference Books:

IBM PC and Clones-B.Govindarajulu