

Detailed Curriculum

Level 3 (Semester I)

(3.GE.01) Language – I

Module 1: Reading comprehension (prescribed texts) and functional grammar

A variety of genres – short stories, expository pieces, biographies, poems, plays, newspaper and magazine excerpts have been included. Teaching of grammar has been integrated with the reading texts. The emphasis is on functional grammar.

The following ten prose texts and five poems have been selected for development of different reading skills.

Prose texts (Prescribed)

1. A warmer or a colder earth (popular science) Arthur – C. Clark
2. The tiger in the tunnel (narrative) – Ruskin Bond.
3. First two or four pages from Sunny Days (autobiographical) – By Sunil Gavaskar
4. Case of suspension (narrative)
5. Big brother (narrative) Shekhar Joshi
6. Father, dear father (news paper article form the Hindu)
7. Face to face (autobiographical) Ved Mehta
8. I must know the truth (narrative) Sigrun Srivastva
9. If I were you (play) Douglas James
10. India, her past and her future (speech) Jawahar Lal Nehru

Poems

1. Leisure – W H Davis
2. The road not taken – Robert Frost
3. Where the mind is without fear- Tagore
4. My grandmother's house – Kamla Das
5. The night of the scorpion – Nissi, Ezekiel

Non prescribed

In this section learners will be exposed to newspaper, articles, tables, diagrams, advertisements etc. which they have to read carefully and interpret. In the examination similar pieces will be used.

Grammar and usage:

The following points of grammar and usage have been selected from the reading passages.

1. agreement/concord: number – gender etc.
2. Tenses: simple past (negatives/interrogatives) present perfect, past perfect continuous, past perfect, expressing future time (will and going to)
3. Passive voice (perfect tenses and modals)
4. Modals (must, should ought to, would)
5. Linking words (to like because although, instead of, if, as, since, who, which that, when however, inspite of)
6. Reported speech, statements, questions (yes/no)

Module 2: Functional writing and study skills

This module help the learner to write descriptive and narrative paragraph, letters, reports notices etc. and also practice skills of note making

1. Paragraph writing
 - Describing objects
 - Describing people
 - Narrating events, stories
2. Letter writing
 - Application for leave
 - Application for jobs
 - Asking for information form various agencies (e.g. Last date for getting prospects; price of items before placing doers etc.)
3. Note making
 - Ending (punctuation, spelling, appropriate vocabulary, structures)

(3.GE.02) Applied Chemistry

1. Structure of Atom:

Rutherford model of the structure of atom, Bohr's theory of electrons, quantum numbers and their significance, de-Broglie equation and uncertainty principle, electronic configuration of 1 to 30 elements.

2. Periodic Properties of Elements:

Periodic law, periodic table, periodicity in properties like atomic radii and volume, ionic radii, ionization energy and electron affinity. Division of elements into s, p, d and f blocks.

3. Chemical Bonds:

Electrovalent, covalent and coordinate bond and their properties. Metallic bonding (electron cloud mode) and properties (like texture, conductance, luster, ductility and malleability).

4. Fuel and their Classification:

Definition, characteristics, classification into solid, liquid and gaseous fuel. Petroleum and brief idea of refining into various factions and their characteristics and uses. Calorific value of fuel, Gaseous fuels- preparation, properties, composition and use of producer gas, water and oil gas.

5. Water:

Impurities in water, methods of their removal, hardness of water, its types, causes and removal, disadvantages of hard water in boilers, pH value and its determination by calorimetric method.

6. Corrosion:

Its meaning, theory of corrosion, prevention of corrosion by various methods using metallic and non-metallic coatings.

7. Plastic and Polymers:

Plastic-thermo-plastic and thermo-setting. Introduction of Polythene. P.V.C. Nylon, synthetic rubber and phenol-formal-dehyde resin, their application in industry.

(3.GE.03) Applied Physics

- 1. Units & Dimensions:** M.K.S. fundamentals & derived units, S.I. base units supplementary units and derived units, Dimensions of various physical quantities, uses of dimensional analysis.

2. **Surface Tension and Viscosity:** molecular forces, molecular theory of surface tension, surface energy, capillary action, concept of viscosity, coefficient of viscosity, principle and construction of viscometers.
3. **Vibrations:** Vibration as simple spring mass system, elementary and qualitative concept of free and forced vibrations, resonance. Effects of vibrations on building bridges and machines members.
4. **Heat:** Temperature and its measurement, thermoelectric, platinum resistance thermometers and pyrometers. Conduction through compound media and laws of radiations.
5. **Ultrasonics:** Productions of ultrasonic waves by magnetostriction and piezo-electric effect, application of ultrasonics in industry.
6. **Optics:** Nature of light, reflection and refraction of a wave from a plane surface. Overhead projector and Epidiascope.

(3.GE.04) Applied Biology – I

1. **Cell-The Unit of Life** Cell theory and cell as the basic unit of life: Structure of prokaryotic and eukaryotic cells; Plant cell and animal cell; cell envelope; cell membrane, cell wall; cell organelles - structure and function; endomembrane system, endoplasmic reticulum, golgi bodies, lysosomes, vacuoles; mitochondria, ribosomes, plastids, microbodies; cytoskeleton, cilia, flagella, centrioles (ultrastructure and function); nucleus.
2. **Biomolecules** Chemical constituents of living cells: Structure and function of proteins, carbohydrates, lipids, nucleic acids; Enzymes- types, properties, enzyme action.
3. **Cell Cycle & Cell Division:** Cell Cycle, Mitosis, Meiosis and their function
4. **Cellular Respiration** - glycolysis, fermentation (anaerobic), TCA cycle and electron transport system (aerobic); energy relations - number of ATP molecules generated; amphibolic pathways; respiratory quotient.
5. **Anatomy & Physiology of Human Body:** Definition, Anatomical terms, Tissues, Glands and membranes, Homeostasis
6. **Blood & its Components:** Different Blood Components and their functions, Coagulation of Blood, Blood Grouping
7. **Human Skeleton:** Identification, Classification and functions of bones, joints and muscles, Physiology of muscle contraction
8. **Sensory Organs:** Eye, Ear, Nose, Tongue and Skin – Structure

(3.GP.01) Applied Chemistry – Lab

1. Proximate analysis of solid fuel.
2. Experiments based on Bomb Calorimeter.
3. Determination of turbidity in a given sample.
4. To determine the flash and fire point of a given lubricating oil.
5. To determine the viscosity of a given lubricating oil by Redwood viscometer.
6. To determine cloud and pour point of a given oil.

(3.GP.02) Applied Physics – Lab

1. To determine the surface tension of a liquid by rise in capillary.

2. To determine the viscosity of a given liquid.
3. To determine the frequency of tuning fork using a sonometer.
4. To determine the frequency of AC main using sonometer.
5. Time period of a cantilever.

Level 3 (Semester II)**(3.GV.01) General Foundation Course – I****1. Introduction to National Health care System:**

- Introduction to healthcare delivery system
- National Health Mission
- National Health Policy
- Issues in Health Care Delivery System in India
- 2. National Health Programme- Background objectives, action plan, targets, operations, achievements and constraints in various National Health Programme.
- 4. Health scenario of India- past, present and future
- 5. Demography & Vital Statistics-
- Demography – its concept
- Vital events of life & its impact on demography

2. Medical terminologies and record keeping

- Derivation of medical terms.
- Define word roots, prefixes, and suffixes.
- Basic medical terms.
- Interpret basic medical abbreviations/symbols.
- Utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system, musculoskeletal system, respiratory system, cardiovascular system, nervous system, and endocrine system.
- Data entry and management on electronic health record system.

3. Medical Law and Ethics

- Medical ethics - Definition - Goal - Scope
- Introduction to Code of conduct
- Basic principles of medical ethics – Confidentiality
- Autonomy and informed consent - Right of patients
- Care of the terminally ill- Euthanasia
- Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.
- Professional Indemnity insurance policy
- Development of standardized protocol

4. Professionalism and Values

- Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality
- Personal values- ethical or moral values
- Attitude and behavior- professional behavior, treating people equally
- Code of conduct , professional accountability and responsibility, misconduct
- Differences between professions and importance of team efforts
- Cultural issues in the healthcare environment

5. Principals of Management

- Introduction to management

- Strategic Management
- Foundations of Planning
- Planning Tools and Techniques
- Decision Making, conflict and stress management
- Managing Change and Innovation
- Understanding Groups and Teams
- Leadership
- Time Management
- Cost and efficiency

(3.GV.02) Basic Electricity

1. **Current Electricity:** Definition of Resistance, Voltage, Current, Power, Energy and their units, Relation between electrical, mechanical and thermal units, Temperature variation of resistance, Difference between AC and DC voltage and current.
2. **D.C. Circuits:** Ohm's Law, Series – parallel resistance circuits, calculation of equivalent resistance, Kirchhoff's Laws and their applications.
3. **Electric Cells:** Primary cell, wet cell, dry cell, battery, Li-ion battery, series and parallel connections of cells, Secondary cells, Lead Acid Cell, Discharging and recharging of cells, preparation of electrolyte, care and maintenance of secondary cells.
4. **Lighting Effects of Current:** Lighting effect of electric current, filaments used in lamps, and Tubelight, LED, their working and applications.
5. **Capacitors:** Capacitor and its capacity, Concept of charging and Discharging of capacitors, Types of Capacitors and their use in circuits, Series and parallel connection of capacitors, Energy stored in a capacitor.
6. **Electromagnetic Effects:** Permanent magnets and Electromagnets, their construction and use, Polarities of an electromagnet and rules for finding them.
Faraday's Laws of Electromagnetic Induction, Dynamically induced e.m.f., its magnitude and induction, inductance and its unit. Mutually induced e.m.f., its magnitude and direction, Energy stored in an inductance.
Force acting on a current carrying conductor in magnetic field, its magnitude and direction, Principles and construction of dynamo.
7. **A.C Circuits**
Generation of A.C. voltage, its generation and wave shape. Cycle, frequency, peak value R.M.S. value, form factor, crest factor, Phase difference, power and power factor, A.C. Series Circuits with (i) resistance and inductance (ii) resistance and capacitance and (iii) resistance inductance and capacitance, Q factor of R.L.C. series circuits.

(3.GV.03) Basic Electronics

1. **Overview of Atom, Sub-Atomic Particles and CRO**
 - Brief History of Electronics.
 - Atom and its elements,
 - Electron, Force, Field intensity, Potential, Energy, current
 - Electric field, Magnetic field, Motion of charged particles in electric and magnetic field.

- Overview of CRO, Electronic and Magnetic deflection in CRO, Applications.
- 2. Voltage and Current**
 - Resistance, Ohm's law, V-I Characteristics, Resistors, Capacitors, Inductors.
 - Voltage and Current sources, Symbols and Graphical representation
 - Overview of AC, DC, Cells and Batteries, Energy and Power.
 - 3. Basics of Semiconductor**
 - Semiconductor materials, Metals and Semiconductors and Photo-electric emission.
 - N-type and P-type semiconductor, Effects of temperature on Conductivity of semiconductor.
 - PN junction diode, depletion layer, Forward & Reverse bias, V-I Characteristic, Effects of temperature, Zener diode, Photo diode, LED, Types and applications of diode.
 - Diode as a rectifier, Half wave and full wave rectification, Zener diode Regulator.
 - Introduction to Filters, Clippers, Clampers
 - 4. Bipolar Junction Transistor**
 - Operation of NPN and PNP transistors, Biasing of BJT.
 - CB, CE and CC configuration
 - Introduction to FET, JFET, MOSFET, CMOS and VMOS
 - 5. Transistor Amplifier and Applications**
 - Introduction, Single and Multi-stage amplifiers
 - Introduction to Oscillators
 - Introduction to Thyristors, PNPN diode, SCR, LASCR, DIAC, TRIAC

(3.GV.04) Applied Biology -II

- 1. Nervous System:** Introduction to nervous system, Classification of nerve fibres, Physiology of nerve transmission, Neurotransmitters, Human Brain, Spinal Cord, Reflexes, Epilepsy, Electroencephalogram, Autonomic Nervous System, Pheripheral Nervous System
- 2. Renal Physiology:** Kidney, Nephron, Urine Formation, Renal Function Test, Dialysis
- 3. Reproductive System:** Male reproductive system, Female reproductive system, Menstrual Cycle, Fertility Control
- 4. Endocrinology:** Hormones, Homeostasis, Pituitary Gland, Thyroid Gland, Parathyroid Gland, Endocrine function of pancreas, Adrenal hormones, Local Hormones
- 5. Digestive System:** Introduction, structure and function of digestive organs Pharynx, esophagus, Stomach, Intestines, Liver & Pancreas.
- 6. Respiratory System:** Physiological Anatomy of respiratory tract, physiology of respiration, different pulmonary volumes, Artificial respiration
- 7. Cardiovascular System:** Structure and physiology of Human Heart, cardiac muscles and cardiac cycle
- 8. Genetics:** Mendelian inheritance; deviations from Mendelism – incomplete dominance, codominance, multiple alleles and inheritance of blood groups, pleiotropy; elementary idea of polygenic inheritance; chromosome theory of inheritance; chromosomes and genes; Sex determination - in humans, birds and honey bee; linkage and crossing over; sex linked inheritance - haemophilia, colour blindness; Mendelian disorders in humans -

thalassemia; chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

9. **Genetic Materials:** Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; transcription, genetic code, translation; gene expression and regulation - lac operon; genome and human and rice genome projects; DNA fingerprinting.

(3.VP.01) Basic Electricity Lab

1. Verify that resistance of conductor is directly proportional to resistivity and length and inversely proportional to cross-sectional area of the conductor.
2. Verification of Ohm's Law.
3. Verification of temperature coefficient of resistance:
 - (i) Positive for Tungsten and Nichrome and
 - (ii) Negative for carbon.
4. Study of series resistive circuits.
5. Study of parallel resistive circuits.
6. Study of series and parallel connection of cells in circuits.
7. Preparation of Electrolyte for lead acid battery and its charging and measurement of Specific gravity with the help of hydrometer.
8. To find heat efficiency of an electric kettle.
9. Charging and Discharging of a capacitor.
10. Verification of magnetic field of a Solenoid with:
 - (i) Iron core and
 - (ii) Air core.
11. Verification of Faraday's Laws of electromagnetic induction.
12. Verification of Torque development in a current carrying coil in magnetic field.
13. Study of R.L. series circuit and measurement of power and power factor.
14. Study of R.C. series circuit and measurement of power and power factor.
15. Study of R.L.C. series circuit and measurement of power and power factor.
16. Study of R.L.C. series circuit for calculation of inductive reactance, capacitive reactance, impedance and Q- Factor.

Instruments Required

- Trainer kit for verifying ohm's law,
- Trainer kit for measuring TCR
- Lead acid battery,
- Hydrometer,
- Electric kettle,
- Trainer kit for measuring power and power factor in RLC circuits

(3.VP.02) Basic Electronics – Lab

1. Study of current and voltage measurement using Ammeter and Voltmeter.
2. Study of current and voltage measurement using Galvanometer.
3. Study of current, voltage and resistance measurement using of Multi-meter
4. Study of Power and Energy measurement using Wattmeter and Energy meter.

5. Study of working principle of Signal Generator and measurement of amplitude, time period and frequency of signal using Oscilloscope.
6. Study of V-I Characteristic of Diode.
7. Study of V-I Characteristic of Zener Diode. And use of Zener Diode as voltage regulator.
8. Study of Half wave rectifier with and without filter circuit.
9. Study of Full wave rectifier with and without filter circuit.
10. Study CE configuration for NPN and PNP transistors and measurement of voltage and current gain.
11. Study CB configuration for NPN and PNP transistors and measurement of voltage and current gain.
12. Study CC configuration for NPN and PNP transistors and measurement of voltage and current gain.
13. Study of working of single layer PCB manufacturing
14. Study of working of double layer PCB manufacturing.
15. Design of 7 segment display using LED and bread board.

Instruments Required

- Ammeter
- Voltmeter,
- Multimeter,
- Galvanometer,
- Energy Meter,
- CRO,
- Diode Trainer kit
- Zener diode Trainer kit
- Rectifier trainer kit
- Transistor characteristics trainer kit,
- PCB manufacturing Lab
- Bread board trainer kit to design 7 segment display.

Level 4 (Semester I)

(4.GV.01) Engineering Science

1. Soldering and Brazing

General characteristics of soldering, brazing joints, processes and their characteristics, brief description of soldering and brazing tools equipment, types of solders and fluxes and their uses, soldering defects and their remedies, brazing materials, advantages and disadvantages of soldering and brazing. Introduction to PCB, PCB designing, wet etching, dry etching, track correction, wiring, single sided and double sided PCB.

2. Measuring Instruments

Construction and working principles of moving iron and moving coil voltmeters and ammeters, dynamometer type wattmeter, ohm meter, megger and induction type energy meter- their circuit connection and application for measurement of electrical quantities.

3. Electrical Engineering Drawing

Schematic and wiring diagram for domestic simple wiring, symbols used for different electrical devices and equipments.

4. Electrical wiring

Types of wiring – cleat wiring, casing and capping, C.T.S./T.R.S. wiring, metal sheath wiring, conduit wiring and concealed wiring – their procedure. Factors of selection of a particular wiring system, importance of switch, fuse

5. Earthing

Earthing of wiring system, types of faults, their causes and remedies. Types of earthing- plate earthing and Pipe earthing, their procedure and application. Methods of finding numbers of circuits and circuit distribution by distribution board system, loop in system of wiring connections IE rules related to wiring.

(4.GV.02) Trouble Shooting & Maintenance of Electronic Equipments-I

1. Basic Occupational Safety and Precautions

2. Microphones and Loudspeakers

- Construction, working principle and frequency response of Carbon Microphone, Variable Reactance Microphone, Capacitance Microphone, Piezo-Electric Microphone, Moving Coil Microphone.
- Frequency ranges of musical instruments, Intensity and Dynamic Range, Constructions and working principles of Moving Coil Loudspeaker, Impedance and Power Level of loudspeaker, Frequency characteristics of Practical Loudspeakers: Woofer, Tweeter, Squawker

3. Recorder

- Block diagram of disk recording and reproduction.
- Principle of optical recording, CD/ DVD manufacturing and recording, CD/ DVD player system, Advantages/ Disadvantages.
- Steps for Fault finding & Analysis.

(4.GV.03) IT Tools-I

- I. Computer Organization & OS: User perspective.
 - Understanding of Hardware.
 - Basics of Operating System.
- II. Networking and Internet.

- Network Safety concerns.
 - Network Security tools and services.
 - Cyber Security.
 - Safe practices on Social networking.
- III. Office automation tools:
- Spreadsheet.
 - Word processing.
 - Presentation.

(4.GE.01) Language - II

Module – 3: Listening and speaking skills

In this module the learners will be exposed to a variety of listening activities recorded on audiotapes. These will be samples of good spoken English, which the learners can use as models. Work sheets will accompany the listening material.

This module will include the following:

1. Introducing yourself/friends in formal and informal situations.
2. Inviting people (over the phone and face to face) giving details of occasion, time place and date. Acceptance and refusal of invitation – formal and informal.
3. Seeking and supplying information (example opening an account in a bank, applying for loans etc.)
4. Talking and conveying messages (over the phone and face to face).
5. Giving directions / instruction.
6. Discussing contemporary issues related to environment, child labour, gender bias etc.
7. Listening to excerpts form television and radio.
8. Listening to poems/plays (prescribed).
9. Listening to speeches / talks.
10. Listening to songs like “We shall overcome”.

Module – 4 to 6: (English for specific purposes) (opt any one)

There modules are being offered. A learner has to opt for any one. The first is for academic purposes and the next two are for vocational purposes. The focus is not on the teaching of the subject matter like science and literature but on the way in which language is used in the deferent subjects.

Module 4: English for Science

This course will introduce learners to some interesting pieces of popular science

1. Health and hygiene
2. Conservation of (nearly extinct) animals.
3. Plant life.
4. Bio gas / solar energy.

These pieces illustrate the use of English in scientific writing: giving information factually, logically and objectively.

Module 4: English for Receptionist

This module will introduce the learners to a variety of exercises, tasks and meaningful activities related to the receptionist’s use of English. The printed course materials will be supported by tapes.

The following competencies be developed:

1. Receiving messages, making request etc.
2. Supplying information

3. Giving advice and making suggestions
4. Dealing with complaints
5. Making entries in an appointment book, register etc.

Module 4: English for Office Use

This course will help the learner to use English effectively and appropriately in the office environment. The competencies will be developed.

1. Using the telephone taking and passing messages.
2. Receiving messages
3. Marking noting on files and circular.
4. Writing office notes, memos, notices, agendas for meetings.
5. Telegrams and fax messages.
6. Writing business letters, application enquires, complaints.
7. Filling in forms, cheques, pay in slips etc.

(4.VP.01) Engineering Science - Lab

1. Introduction to tools and measuring instruments, their safe keeping, safety
2. precautions
3. Measurement of resistance by ammeter and voltmeter method and Ohm meter.
4. Dismantling and reassembly of dynamo.
5. Calibration of ammeter, voltmeter and wattmeter with the help of standard meters.
6. Calibration of single phase energy meter with the help of standard wattmeter and stop watch.
7. Controlling lamps in series, parallel and series parallel.
8. Controlling lamps for two or three places.
9. Drawing schematic diagram to give supply to consumers.
10. Practice on casing and capping wiring.
11. Practice on cleat wiring.
12. Practice on CTS/TRS wiring.
13. Practice on metal sheet weather proof rigid PVC wiring.
14. Practice on conduit wiring.
15. Practice on concealed wiring.
16. Measurement of insulation resistance of wiring installation by megger.
17. Polarity test of wiring installation.
18. Testing of wiring installation.
19. Installation of pipe earthing for wiring installation.
20. Installation of plate earthing for wiring installation.

Instruments Required

- Ammeter
- Voltmeter
- Ohm meter
- Dynamo
- Wattmeter,
- Stop watch controlling lamp
- Different types of wire for practice on wiring,
- Conduit pipes
- Megger
- Materials for earthing

(4.VP.02) Trouble Shooting & Maintenance of Electronic Equipment's**Lab**

1. Assembly study and fault finding of an audio amplifier.
2. Assembly, study and fault finding of a graphic equaliser.
3. Study working, assembly & fault finding of Colour TV.
4. Study working, assembly & fault finding of LCD TV.
5. To trace the fault in the following panel controls and correct them:
 - Volume control.
 - Brightness control.
 - Contrast control.
 - Vertical hold control.
6. To trace the following stages of T.V. set: Tuner, MF stage, Video detector, Video amplifier.
 - Sound I.T. Sound output stage.
 - Syne separator.
 - Vertical oscillator.
 - Horizontal oscillator.
 - Line Driver Stage.
 - Line output transformer.
 - Power supply.
7. To find fault for the following defects:
 - No picture no sound.
 - Sound present, picture missing.
 - Picture rolls vertically.
 - Picture tears (Horizontal oscillator).
 - Faults in tuner/IF/power supply.
8. Study working, assembly & fault finding of tape recorder system.
9. Study working, assembly & fault finding of CD/DVD player system.
10. Study working, assembly & fault finding of Printer.
11. Study working, assembly & fault finding of Scanner.
12. Study working, assembly & fault finding of Microwave oven.
13. Study working, assembly & fault finding of Telephone.
14. Study working, assembly & fault finding of Fax Machine.
15. Study working, assembly & fault finding of UPS system.
16. Study working, assembly & fault finding of DTH kit.

Equipment's Required

1. Demo kit to understand the working of different section of colour TV and to create the fault and rectifying the faults.
2. Trainer kit/ demo module to understand the working and fault finding of tape recorder system
3. Trainer kit/ demo module to understand the working and fault finding of CD/ DVD system
4. Trainer kit/ demo module to understand the working and fault finding of Printer system
5. Trainer kit/ demo module to understand the working and fault finding of Scanner system

6. Trainer kit/ demo module to understand the working and fault finding of Microwave oven system
7. Trainer kit/ demo module to understand the working and fault finding of Telephone system
8. Trainer kit/ demo module to understand the working and fault finding of Fax Machine system
9. Trainer kit/ demo module to understand the working and fault finding of UPS system
10. Trainer kit/ demo module to understand the working and fault finding of DTH kit

Level 4 (Semester II)**(4.GV.04) Physics and Technology in Imaging**

1. **Physical Quantity, its unit and measurement:** Fundamental and derived quantity, SI unit, various physical/radiation quantity used in Diagnostic Radiology and its unit (for example, KVp, mA, mAS, Heat unit (HU))
2. **Radiation quantities and units:** Radiation intensity-exposure, roentgen, its limitations-kerma and absorbed dose-electronic equilibrium-rad, gray, conversion factor for roentgen to rad-quality factor-dose equivalent-rem, Sievert. Quality factor, dose equivalent, relationship between absorbed dose and equivalent dose.
3. **Radiation detection and measurements:** Principle of radiation detection-Basic principles of ionization chambers, proportional counters, G.M counters and scintillation detectors. Measuring system: free ionization chamber-thimble ion chamber-condenser chamber-secondary standard dosimeter-film dosimeter-chemical dosimeter-Thermo Luminescent Dosimeter-Pocket dosimeter.
4. **Radiation intensity** and exposure, photon flux and energy flux density.
5. **Photochemistry:** Principles: Acidity, alkalinity, pH, the processing cycle, development, developer solution. Fixing, fixer solution, washing, drying replenishment, checking and adjusting-latent image formation--nature of development-constitution of developer-development time-factors in the use of developer. Fixers-constitution of fixing solution-factors affecting the fixer-replenishment of fixer-silver conservation-Drying-developer and fixer for automatic film processor-rinsing-washing and drying. Replenishment rates in manual and automatic processing-Silver recovery-Auto and manual chemicals.
6. **X-rays:** Discovery of x-rays-X-ray production and properties: Bremsstrahlung radiations-Characteristics X-Rays, factors affecting X-ray emission spectra, X-ray quality and quantity, HVL measurements, heel effect, soft and hard X-Rays, added and inherent filtration, reflection and transmission targets.
7. **Fluoroscopy:** Fluorescence and phosphorescence - description, fluorescent materials used in fluoroscopic screens, construction of fluoroscopic screen and related accessories, tilting table, dark adaptation. Basic principles of cine fluoroscopy and angiography use of grid controlled x-ray tube.

(4.GV.05) Digital Electronics

1. **Number Systems and Boolean Algebra**
 - Basics of Analog and Digital.
 - Boolean algebra, De-morgan's law, Truth tables.
2. **Logical Circuits**
 - Logic gates: AND, OR, NOT, NOR, NAND, XOR, XNOR.
 - Combinational Circuits:
 - Arithmetic Circuits: Half adders, Full adders, Subtractors,
 - Data Processing Circuits: Encoders, Decoders, Multiplexers, De-Multiplexers
3. **Latches and Flip-Flops**
 - Concept of Latches, Types of Latches, SR latch.
 - SR Flip Flop, JK Flip Flop, D Flip flop, T Flip Flop, Flip Flop.
 - Introduction to counters, Types of counters Asynchronous and Synchronous.
 - Introduction to shift registers, types of shift registers,
4. **Introduction to Display Devices**
 - LED, LCD, 7 segment display
5. **Integrated Circuits and Memories**
 - Introduction to IC's, Importance and applications, Linear and Digital IC's.

- Introduction to SSI, MSI, LSI and VLSI (Terminology & Definitions).
- Memory Organisation and Operations, RAM, ROM.

(4.GV.06) Trouble Shooting & Maintenance of Electronics Equipment's-II

1. TV System

- Working principle with block diagram of TV transmitter and receiver, Brief description with circuit diagram: TV Tuner, Video IF stage, Sound stage, Picture tube & its associated circuit, Synchronizing circuits, Horizontal & vertical deflection circuits, Remote control of a TV receiver, Idea of bandwidth, blanking and synchronization pulses, modulation scheme, colour transmission.
- Cable type TV system, Head end processor, Trunk & cable distribution system with block diagram, Scrambling.
- Introduction to LCD and LED TV systems, Introduction to high definition systems. Steps for Fault finding & Analysis.

2. Modern Appliances

Working principle and block diagram of following: Microwave oven, Telephone, Fax machine, Printers, Scanners. Steps for Fault finding & Analysis. Working principle and block diagram of following: Microwave oven, Telephone, Fax machine, Printers, Scanners. Steps for Fault finding & Analysis. Working principle and block diagram of following: Microwave oven, Telephone, Fax machine, Printers, Scanners. Steps for Fault finding & Analysis.

(4.GV.07) IT Tools-II

I. Multi Media Design: (Open Source Design Tools).

- Interface and Drawing Tools in GIMP.
- Applying Filters.
- Creating and handling multiple layers.
- Using Stamping and Smudging tools.
- Importing pictures.

II. Troubleshooting: Hardware, Software and Networking.

- Commonly encountered problems.
- (Monitor: No display, KB/Mouse not responding, monitor giving beeps, printer not responding, check for virus, Delete temporary files if system is slow, adjust mouse speed).

III. Work Integrated Learning IT - ISM

- Identification of Work Areas.
- Work Experience.

(4.VP.03) IT Tools - Lab

- Spreadsheets, Word, Presentation
- Multimedia Design
- Troubleshooting
- Project / Practical File
- Viva Voce

(4.VP.04) Digital Electronics - Lab

1. Verification of truth tables for AND, OR, NOT and NAND logic gates.

2. Verification of truth tables for NOR, XOR and XNOR logic gates.
3. Construction and verification of operations of half adder and full adder circuits using basic gates.
4. Construction and verification of operations of half adder and full adder circuits using XOR gates.
5. Construction and verification of operations of full adder and full adder circuits using NAND gates.
6. Construction and verification of operations of half & full Subtractor circuit using basic gates.
7. Construction and verification of operations of half & full Subtractor circuit using XOR gates.
8. Construction and verification of operations of half & full Subtractor circuit using NAND gates.
9. Study and verification of truth tables for 3 line to 8 line decoder.
10. Study and verification of truth tables for 8 line to 3 line and 10 line to 4 line encoder.
11. Study and verification of truth tables for 4:1 MUX using gates
12. Study and verification of truth tables for 1:4 DEMUX using gates.
13. Study and verification of truth tables for 8:1 MUX using IC 74151.
14. Study and verification of truth tables for 1:8 DEMUX using IC 74138.
15. To study and verify the truth table of excess-3 to BCD code converter.
16. To study and verify the truth table of binary to gray code converter.
17. Construction and verification of truth tables for S-R, D and J-K flip flops.
18. Study working of various display devices. (LED, Common anode, Common cathode 7 segment display)
19. Study and verification of truth table for universal shift register.
20. Study the operation of a synchronous counter.

Level 5 (Semester I)

(5.GV.01) Electronic Measurements and Instrumentation-II

Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards.

Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis.

PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter

Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes Digital voltmeter systems, digital multimeters, digital frequency meter system.

(5.GV.02) Basic Anatomy (Cross Sectional Anatomy-II)

1. Introduction to Sectional Anatomy & Terminology- Sectional planes, Anatomical relationships/terminology
2. Anatomy of the upper thorax and mid thorax- Surface anatomy relationships, Bony structures and muscles, Blood vessels, Lungs, heart and great vessels, Esophagus
3. Anatomy of the Abdomen- Major organs and their accessories, Abdominal blood vessels
4. Anatomy of the Pelvis- Bony structures and associated muscles, Digestive and urinary systems
5. Neuro Anatomy- Scan planes
6. Brain - Cerebral hemispheres, Sinuses, Ventricles, Brainstem and associated parts, Arterial/venous systems, Basal ganglia, Cranial nerves
7. Spine- Vertebra and disc, Spinal cord and meninges
8. Neck- Arterial/venous systems, Muscles, Glands and pharynx

(5.GV.03) Tools, Equipment and Safety Measures-I

1. Cables & Connectors

- Non-Metallic Sheathed Cable
- Un grounded & Grounded Power Supply Cable
- Metallic Sheathed Cable
- Multi-Conductor Cable
- Coaxial Cable
- Unshielded Twisted Pair Cable
- Shielded twisted pair cable
- Ribbon Cable
- Armoured & Unarmoured Cable
- Twin-Lead Cable
- Twin axial Cable
- Optical fiber cable
- Connectors

2. ESD Clothing

- What to wear, how to wear

(5.GV.04) Soldering & De-Soldering of Components-I

1. Soldering & De Soldering of Basic Components

- Soldering Tools
- Different types of Soldering Guns related to Temperature and wattages, types of tips
- Solder materials and their grading
- Soldering and De Soldering Stations and their Specifications
- Preparing Component for Soldering
- PCB Applications
- Types of PCB
- Soldering Basic Components on PCB
- De soldering Basic Components
- Safety precautions while Soldering & De soldering
- Check for cold continuity of PCB
- Identification of loose/dry solder, broken tracks on printed wire assemblies & discrete components mounted circuit boards
- Join the broken PCB track and test
- De soldering using Pump and wick
- Introduction of SMD Components

(5.VP.01) Identification of Components, Tools, Equipments & its working -Lab

1. Identification & working of various electronic components
2. Working of testing equipment
3. Measurement using Multimeter & Clamp meter
4. Battery health check-up
5. Measure and test the voltage of given cells.

(5.VP.02) Basic Diagnostics (Lab)

1. X-Ray Imaging

- X-Ray Tubes.
- Stationary & Rotation Anode.
- X-ray Consolestation (Demo of KV, MA and exposure time settings).
- Procedures to reduce Scattered Radiation.
- Focus Principle.
- Grids.
- Screen.
- Image intensifiers.
- Use of contrast materials.

2. Dark Room Technique

- Images to ring devices.
- Film cassette construction.
- Duplicating a films
- Spectrum.
- Films types - Specialized use.
- Operation, storage.
- Photo chemistry.
- Development.

- Fixing.
- Radiation protection, counters.
- Assessment.

3. Radiological Positioning

- Patient transfer technique.
- Turning the patient.
- Restraint techniques - Trauma, Pediatric, Geriatric, Physically handicapped, disturbed patients, an anesthetized patient, moving chair & stretcher patients.
- Tubes & catheters, Nasogastric, chest, Urinary, intravenous, oxygen & other (Castsurgical & cardiac) Alcoholic, bed pans & urinals.
- Assessment.

Level 5 (Semester II)

(5.GV.05) Electronic Measurements and Instrumentation - II

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter

CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications
Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument
Recorders: X-Y recorders, plotters

(5.GV.06) Basic Imaging

- 1. The photographic Process:** Introduction, visible light, images produced by radiation, light sensitive photographic materials.
- 2. Image Characteristic:** Real and mental images, reflected, transmitted and emitted light images Photographic emulsions. The photographic latent image. Positive process
- 3. Film materials in X-ray:** History, structure of an x- ray film, single and double emulsion films, types of films, cross over effect.
- 4. Spectral sensitivity** of film material, graininess of film material, speed and contrast of photographic materials.
- 5. Sensitometry:** Photographic density, characteristic curves, features of the characteristic curve.
- 6. Intensifying screens and cassettes.** Cassette design, care of cassettes, types of cassettes, and mounting of intensifying screens, loading and unloading of cassettes, Care of intensifying screens, tests to check screen film contact and light leakage.
- 7. The fluorescent materials,** types of intensifying screens, intensification factor. The influence of KV, scattered radiation. Detail, sharpness and speed, size of the crystals, reciprocity failure, and quantum mottle.
- 8. Film processing:** Development. The nature of development-manual or automatic. The PH scale, constitution of developing solutions both in manual and automatic processing and properties of developing chemicals, development time, factors in the use of a developer, developer activity.
- 9. Dark Room:** Layout and planning. Dark room construction - Nature of floor, walls, ceiling and radiation protection, Dark room equipment and its layout. Location of pass through boxes or cassette hatches.
- 10. Radiographic Image:** Components in image quality-density, contrast and detail.
- 11. Photo Fluorography:** Cine cameras, cine fluorography, cine film, serial cameras, processing of cine films, flurographic films.

(5.GV.07) Tools, Equipment & Safety Measures-II

1. Tools & Equipment
 - Types of tools & equipment required and deployed in manufacturing, installing & servicing
 - Identification and termination process
 - General maintenance of tools/equipment and recalibration of Test equipment
 - General safety and common-sense safety
2. PPE

- Usage & benefits of PPE
 - Types & usage of various PPE
 - Maintenance of PPE
3. Clean Room Environment
 - Do's and Don't
 - Shop Floor Discipline

(5.GV.08) Soldering & De-soldering components & Emergency actions

1. Introduction to SMD Components

- Identification of 2, 3, 4 terminal SMD components
- Soldering the SMD components on the PCB
- Make the necessary settings on SMD soldering station to solder various ICs of different packages by choosing proper clamping tools
- Identify various connections and the setup required for SMD soldering station
- De solder the SMD components from the given PCB
- Make the necessary settings on SMD soldering station to de solder various ICs of different packages by choosing proper clamping tools
- Make a panel board using different types of switches for a given application
- Identification of crimping tools for various IC packages
- Reliable Soldering Practices

2. Emergency actions

- Minimum Requirements
- Reporting Emergencies
- Emergency exits
- Primary and secondary evacuation routes
- Locations of fire extinguishers
- Fire alarm pull stations' location
- Assembly points
- Medical Services

(5.VP.03) Soldering & De-soldering components - Lab

1. Assemble the product
2. Dis-assemble the product
3. Safety Precautions & emergency plans

(5.VP.04) Basic Imaging Practicals Lab

1. Test to check the x-ray films and screen contact in the cassette
2. Test to check light leakage in the cassette.
3. To check the effect of safe light on exposed as well as unexposed x-ray film