

**Junior Technical Superintendent (JTS)**

**Physics**

**Electronics:**

Intrinsic and extrinsic semiconductors, variation of resistivity with temperature, Fermi level, pn junction diode, IV characteristics, Zener diode and its applications, BJT: characteristics in CB, CE, CC modes, Single stage amplifier, two stage R-C coupled amplifiers, Simple Oscillators: Barkhausen condition, sinusoidal oscillators, integrated circuits; Operational amplifiers: feedback, mathematical operations, application circuits, active filters, non-linear circuits, comparators, relaxation oscillator; Fundamentals of digital circuits, Boolean algebra: Binary number systems; conversion from one system to another system; binary addition and subtraction, logic gates, Truth tables; combination of gates; de Morgan's theorem, flip-flops, registers, counters, 7-segment displays, AD and DA converters;

**Experimental Physics:**

Current voltage characteristics of diodes & transistors, experiments related to the application of diodes & transistors, determination of Band gap of semiconductor, Basic understanding of Digital Oscilloscope, Basic understanding of circuit design with integrated circuits, Arduino Uno-features: circuit programming and applications, circuit design for OPAMP mathematical operations, Basic experiments in Mechanics, Electromagnetism and Optics, Error analysis.

**Electromagnetic Theory & Condensed Matter Physics:**

Coulomb's law, Gauss's law, Laplace & Poisson equation, Conductors, Capacitors, and Dielectrics, Biot-Savart law, Ampere's law, Faraday's law. Alternating current, Displacement current, Maxwell's equations, electromagnetic waves, Specific heat of solid, Band theory of solids, Superconductivity: type-I and type-II superconductors, Dielectric, magnetic and optical properties of materials.