भारतीय प्रौद्योगिकी संस्थान तिरुपती
TIRUPATI
INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
भारतीय प्रौद्योगिकी संस्थान तिरुपति
Renigunta Road, Settipalli Post, Chittoor District, Tirupati – 517506

Laboratory Assistant	**Physics**

Mathematical Physics: Vector algebra, Vector Calculus, Differential equations, Matrices and determinants, Eigen values and Eigen vectors, Algebra of complex numbers, Fourier analysis.
Mechanics: Newton's laws of motion, Cartesian and polar coordinate system, non-inertial frames, Central force, Kepler's laws, Conservative and non-conservative forces, Elastic and inelastic collisions, Rigid body motion, Fluid dynamics, Bernoulli's theorem.
Waves, Oscillations, and Optics: Simple harmonic, damped, and forced oscillators. Wave equation, Group and phase velocity, Sound, Doppler Effect. Fermat's Principle, Interference, Diffraction, Polarization of light.
Electromagnetic Theory and Special Theory of Relativity: 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, Poynting's theorem, Lorentz Force. Postulates of special relativity, Lorentz transformations, Length contraction, time dilation, Mass energy equivalence.
Modern Physics and Quantum Mechanics: Black body radiation, Photoelectric and Compton Effect, Bohr's atomic model, Wave-particle duality, Superposition principle, Schrödinger equation, Eigenvalue problems, Commutators, Heisenberg uncertainty principle, Angular momentum algebra, Hydrogen atom, Stern-Gerlach experiment, Hund's rule, L-S and j-j coupling, Zeeman, Paschen-Back & Stark effects. Nuclear and Particle Physics: Structure of nuclei, Radio activity, Nuclear models, Rutherford scattering, fission and fusion, elementary particles, quark model.
Kinetic theory, Thermodynamics, and Statistical mechanics: Kinetic theory of gases, Specific heat of gases, Laws of thermodynamics, Maxwell's thermodynamic relations, Thermodynamic potentials, Phase transitions, Clausius-Clapeyron equation. Ensembles, Partition functions, Classical and quantum statistics.
Condensed Matter Physics: Bravais lattice, Reciprocal lattice, Miller Indices, Bragg's Law, Bonding in solid. Drude, Free-electron, Kronig-Penney, Tight-binding and near free-electron models. Specific heat of solid. Band theory of solids. Superconductivity: type-I and type-II superconductors. Dielectric, magnetic and optical properties of materials.
Electronics: Semiconductors, p-n junction diode, Zener diode, Bipolar junction transistor, Field effect transistor, Amplifiers, Oscillators, Operational amplifier, Boolean algebra, Logic Gates, de Morgan's theorem.

Experiments in Physics (Bachler and Master degree level):
Experiments in Mechanics, Properties of Materials, Heat, Electromagnetism and Optics. Error analysis. Circuit diagrams. A few examples of experiments are Compound pendulum, Velocity of sound and bulk modulus using Ultrasonic Interferometer, Band gap of a Semiconductor by four-probe method, Wavelength of light by interference and diffraction based techniques, Mapping of equipotential lines, Basic understanding of Digital Oscilloscope, Hall effect, Determination of Planck's constant, *etc*