KADI SARVAVISHVAVIDYALAYA - GANDHINAGAR
Syllabus of Ph.D. course work
PHYSICS

Note : PAPER 1 & 2 ARE COMMON WITH CHEMISTRY

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PHYSICS

Paper III

Unit 1 Mathematical Methods of Physics

Dimensional analysis, vector algebra and vector calculus. Linear algebra, matrices. Linear ordinary differential equations of first & second order, Special functions (Hermite, Bessel, Laguerre and Legendre functions). Fourier series Fourier and Laplace transforms. Elementary probability theory, random variables binomial, Poisson and normal distributions. Central limit theorem. Data interpretation and analysis. Precision and accuracy. Error analysis, propagation of errors. Least squares fitting, Linear and nonlinear curve fitting, chi-square test.

Unit 2 Atomic & Molecular Physics

Quantum states of an electron in an atom. Electron spin. Spectrum of helium and alkali atom. Relativistic corrections for energy levels of hydrogen atom, hyperfine structure and isotopic shift, width of spectrum lines, LS & JJ couplings. Zeeman, Paschen-Bach & Stark effects. Electron spin resonance. Nuclear magnetic resonance, chemical shift. Frank-Condon principle. Born-Oppenheimer approximation. Electronic, rotational, vibrational and Raman spectra of diatomic molecules

Unit 3 Electronics and Experimental Methods

Opto-electronic devices (solar cells, photo-detectors, LEDs). Operational amplifiers and their applications. Digital techniques and applications (registers, counters, comparators and similar circuits). A/D and D/A converters. Microprocessor and microcontroller basics.

Transducers (temperature, pressure/vacuum, magnetic fields, vibration, optical, and particle detectors). Measurement and control. Signal conditioning and recovery. Impedance matching, amplification (Op-amp based, instrumentation amp, feedback), filtering and noise reduction