सिद्धार्थ विश्वविद्यालय, कपिलवस्तु, सिद्धार्थनगर

Syllabus of Pre-Ph.D. course work

Subject: PHYSICS

Paper – I: Research Methodology

Part A

Unit I: Special functions (Hermite, Bessel, Laguerre and Legendre functions). Fourier series, Fourier and Laplace transforms.
Central force motions. Principle of least action. Generalized coordinates. Conservation laws and cyclic coordinates.
Gauss's law. Biot-Savart law, Ampere's theorem. Electromagnetic induction. Maxwell's equations in free space and linear isotropic media.

Unit II: Wave-particle duality. Schrödinger equation. Eigenvalue problems –potential well, potential barrier. Wave-function in coordinate and momentum representations. Commutators and Heisenberg uncertainty principle.
Laws of thermodynamics, Thermodynamic potentials, Maxwell relations, chemical potential, phase equilibria. Phase space, micro- and macro-states. Micro-canonical, canonical and grand-canonical ensembles and partition functions. Blackbody radiation and Planck's distribution law.

Unit III: Semiconductor devices (diodes, junctions, transistors, field effect devices, homo- and hetero-junction devices), device characteristics, frequency dependence and applications, I – V Characteristics of photo cell, solar cells, photo-detectors, LEDs. Digital Electronics: Universal Gates, XOR gates.
Lasers: Einstein A & B coefficients. Optical pumping, population inversion, rate equation.

Unit IV

Bravais lattices. Reciprocal lattice. Diffraction and the structure factor.Band theory of solids: metals, insulators and semiconductors. Superconductivity: type-I and type-II superconductors.
Basic nuclear properties: size, shape and charge distribution, spin and parity. Binding energy, semi-empirical mass formula, liquid drop model, shell model. Classification of fundamental forces. Elementary particles and their quantum numbers. Quark model, baryons and mesons.

Part B

Review of literature, National and International importance of the research topic allotted.

Paper-II : Basic Computer Application

Unit-One
Computer Fundamentals,
What is Desktop PC System?
Working of a Monitor,
Keyboard,
Mouse,
Hard Disk,
Compact Disk and Printer

Unit-Two
Working with the Control Panel
Customize your Desk top
Working with files and folders

Unit-Three
Features of MS-Word
Working with MS-Word, Formatting documents and texts

Unit-Four
Introduction to Excel and Power Point Presentation

Unit-Five
Working on Internet and e-mail