INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN AND MANUFACTURING (IIITD&M) KANCHEEPURAM

INTRODUCTION OF NEW COURSE

Course Title	Quantum Mechanics	Course No *(will be assigned)*					
Specialization	Physics	Structure (LTPC)	3	0	0	3	
Offered for	PG/Ph.D	Status	Core ☐		Elective ■		
Faculty	Dr. Tapas Sil	Type	New ■		Modification ☐		
Pre-requisite	Classical mechanics	To take effect from	January 2013				
Submission date	October 2012	Date of approval by AAC					
Objectives	To know the nature and dynamic processes of microscopic system						
Contents of the course *(With approximate break up of hours)*	1. Recapitulation of Basic Concepts (9hrs): Eigenvalues and eigenfunctions: Momentum and parity operators; Commutativity and simultaneous eigenfunctions; Complete set of eigenfunctions; expansion of wave function in terms of a complete set. One-dimensional problems: Square well problem (E > 0); Delta-function potential; Double-delta potential; Multiple well potential, Kronig-Penney model. 2. Operator method in Quantum Mechanics (8hrs): Formulation of Quantum Mechanics in vector space language; Uncertainty principle for two arbitrary operators; One dimensional harmonic oscillator by operator method. 3. Quantum theory of measurement and time evolution (3hrs): Double Stern-Gerlach experiment for spin- ½ system; Schrodinger, Heisenberg and interaction pictures. 4. Three-dimensional problems (5hrs): Three dimensional problems in Cartesian and spherical polar coordinates, 3-d well and Fermi energy; Radial equation of free particle and 3-d harmonic oscillator. 5. Angular momentum (6hrs): Angular momentum algebra; Raising and lowering operators; Matrix representation for j = 1/2 and j = 1; Spin; Addition of two angular momenta, Clebsch-Gordan coefficients, examples. 6. Approximation Methods (11hrs): Time independent perturbation theory: First and second order corrections to the energy eigenvalues; First order correction to the eigenvector; Degenerate perturbation theory, Spin-orbit coupling (L-S and j-j), Zeeman effect and Stark effect. Variational method: He atom as an example.						
Textbook	1. L.I. Schiff: Quantum Mechanics, McGraw-Hill 2. D.J. Griffiths : Introduction of Quantum Mechanics, Prentice Hall						
References	1. J.J. Sakurai: Modern Quantum Mechanics, Pearson Education 2. P.M. Mathews and K. Venkatesan: A Text Book of Quantum Mechanics, Tata McGraw-Hill 3 E. Merzbacher: Quantum Mechanics, John Wiley & Sons, Inc.						