DEGREE PROGRAM

B.Sc. V Sem.

SUBJECT CODE	Category	SUBJECT NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			End Sem University Exam	Two Term Exam	Teachers Assessment *	End Sem University Exam	Teachers Assessment*				
BSPH502	DC	**QUANTUM MECHANICS**	60	20	20	30	20	3	1	4	6

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
Q/A – Quiz/Assignment/Attendance, MST MidSem Test.
*Teacher Assessment shall be based on following components: Quiz/Assignment/ Project/Participation in class (Given that no component shall be exceed 10 Marks)

Course Objectives:-

1. To develop the comprehensive understanding of laws of physics related to Quantum Mechanics and ability to apply them for laying the foundation for research and development.
2. To work ethically as member as well as leader in a diverse team.

Course Outcomes:-

1. Student will be able to understand and solve the problems related to Quantum Mechanics,
2. Student will be able to determine physical parameter experimentally with optimal usage of resources and complete the assignments in time.

Joint Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

QUANTUM MECHANICS

UNIT-I

Particles and waves inadequacies in classical physics, Blackbody radiation: quantum theory of light. Photoelectric effect, Compton Effect, Wave nature of matter: de Broglie hypothesis. Wave-particle duality, Davisson-germer experiment, Wave description of particles by wave packets.Group and phase velocities and relation between them, Two-slit experiment with electrons. Probability, Wave amplitude and wave functions

UNIT-II

Heisenberg's uncertainty principle (uncertainty relations involving canonical pair of variables): derivation from wave packets. Energy, momentum and Hamiltonian operators, Time-independent Schrodinger wave equation for stationary states, Properties of wave Function. Interpretation of wave function, Probability density, Conditions for physical acceptability of wave functions, .Linearity and superposition Principles, Eigen values and Eigen functions

UNIT-III

Expectation values, Wave function of a free Particle. Applications of Schrödinger wave equation: Eigen functions and Eigen values for a particle in a one dimensional box. general features of a bound Particle system, (1) one dimensional Simple harmonic oscillator: energy levels and wave Functions. Zero point energy, (2) Quantum theory of hydrogen atom: particle in a spherically symmetric potential.

UNIT-IV

Schrodinger wave equation, Separation of variable, .Radial solutions and principal quantum Number, orbital and magnetic quantum numbers, Quantization of energy and Angular Momentum, Space quantization, Electron probability Density.

UNIT-V

Finite Potential Step: Reflection and Transmission. Stationary solutions, Probability current, Attractive and repulsive potential Barriers (2) Quantum phenomenon of tunneling: tunnel effect. Tunnel diode (qualitative Description) (3) Finite potential well (Square well)

Suggested books:

1. L. I. Schiff, quantum mechanics, 3rd Edition, (McGraw hill book co., New York 1968).

2. E. Merzbacher, quantum mechanics, 3rd Edition, (john Wiley & sons, inc1997)

3. J.l. Powell & b. Crasemann, quantum mechanics, (Addison-Wesley pubs.co., 1965)

4. A. Ghatak& s. Lokanathan, quantum mechanics: theory and applications, 5th Edition, (Macmillan India, 2004)

5. E. M. Lifshitz and l. D. Landau, quantum mechanics: non-relativistic theory (course of Theoretical physics, vol 3), 3rd Edition, butterworth-heinemann (1981).

References

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5. E. M. Lifshitz and l. D. Landau, quantum mechanics: non-relativistic theory (course of Theoretical physics, vol 3), 3rd Edition, butterworth-heinemann (1981).

6. Quantum mechanics: foundations and applications by Arno bohm.--3rd ed.—(New York: Springer-verlag, 20