DEGREE PROGRAM

B. Sc VI Sem.

SUBJECT CODE	Category	SUBJECT NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			End Sem Uni-versity Exam	Two Term Exam	Teachers Ass-sessment *	End Sem Uni-versity Exam	Teachers Ass-sessment*				
BSPH602	DC	Atomic, Molecular and Nuclear Physics	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 Mid Sem 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 toAtomic. Molecular and Nuclear Physicsand ability to apply them for laying the foundation for research and development.
2. To work cthically as mcmbcr as well as leader in a diverse team.

Course Outcomes:-

1. Student will be able to understand and solve the problems related toAtomic, Molecular and Nuclear Physics,
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

Atomic, Molecular and Nuclear Physics

UNIT-I

Atoms in Electric and Magnetic Fields: - Electron Angular Momentum, Electron Spin and Spin Angular Momentum, Stern-Gerlach Experiment. Zeeman Effect: Electron Magnetic Moment and Magnetic Energy, Gyro magnetic Ratio and Bohr Magneto Pauli's Exclusion Principle. Symmetric and Anti symmetric Wave Functions. Periodic table, Fine structure, Spin orbit coupling. Total Angular Momentum, Vector Model L-S and J-J couplings

UNIT-II

Molecular Spectra: - Rotational Energy levels, Selection Rules and Pure Rotational Spectra of a Molecule, Vibrational Energy Levels, Selection Rules and Vibration Spectra. Rotation Vibration Energy Levels, Selection Rules and Rotation-Vibration Spectra, Determination of Inter-nuclear Distance, Raman Effect and Quantum Theory of Raman Effect, Complimentary Character of Raman and infrared Spectra

UNIT-III

Structure of nuclei: - basic properties of nuclei, binding energy. Quadra pole moment, Nuclear forces α -decay: - range of α-particles, Geiger-Nuttal law and α-particle spectra. Gamow theory of alpha decay, β-decay: - energy spectra and neutrino hypothesis. B-decay: - energy spectra and neutrino hypothesis, Nuclear reactions: - types of reactions and conservation laws. Concept of compound and direct reactions, Compound Reaction rate, Q-value of nuclear reaction, Nuclear Fission and Fusion.

UNIT-IV

Nuclear models: - Liquid drop model and Semi empirical mass formula, Shell model, Linear accelerator, Cyclotron, Betatron, Synchro-cyclotron. Detectors and Counters: Ionization chamber, Proportional Counter, GM Counter., Wilson cloud chamber, Scintillation detectors. Semiconductor detectors, Bain bridge mass spectrograph.

UNIT-V

Elementary particles - fundamental interactions, Classification of elementary particles, Particles and antiparticles, baryons, hyperons, leptons, and mesons., Elementary particle quantum numbers: baryon number, lepton number, strangeness, electric charge, hypercharge and isospin.

Suggested books:

1. Concepts of modern physics by Arthur beiser (McGraw -hill book company, 1987)

2. Concepts of nuclear physics by Bernard l.cohen.(new Delhi: Tata McGraw hill, 1998).

3. Introduction to the physics of nuclei and particles by r.a. Dunlap.(Singapore: Thomson Asia, 2004).

4. Nuclear physics by Irving Kaplan. (Oxford & ibh, 1962).

5. Introductory nuclear physics by Kenneth s. Krane. (John Wiley & sons, 19